The ELECTRICAL REVIEW

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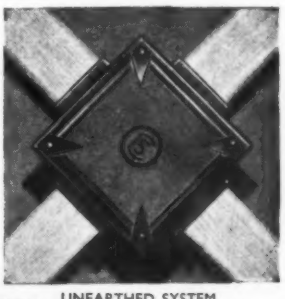

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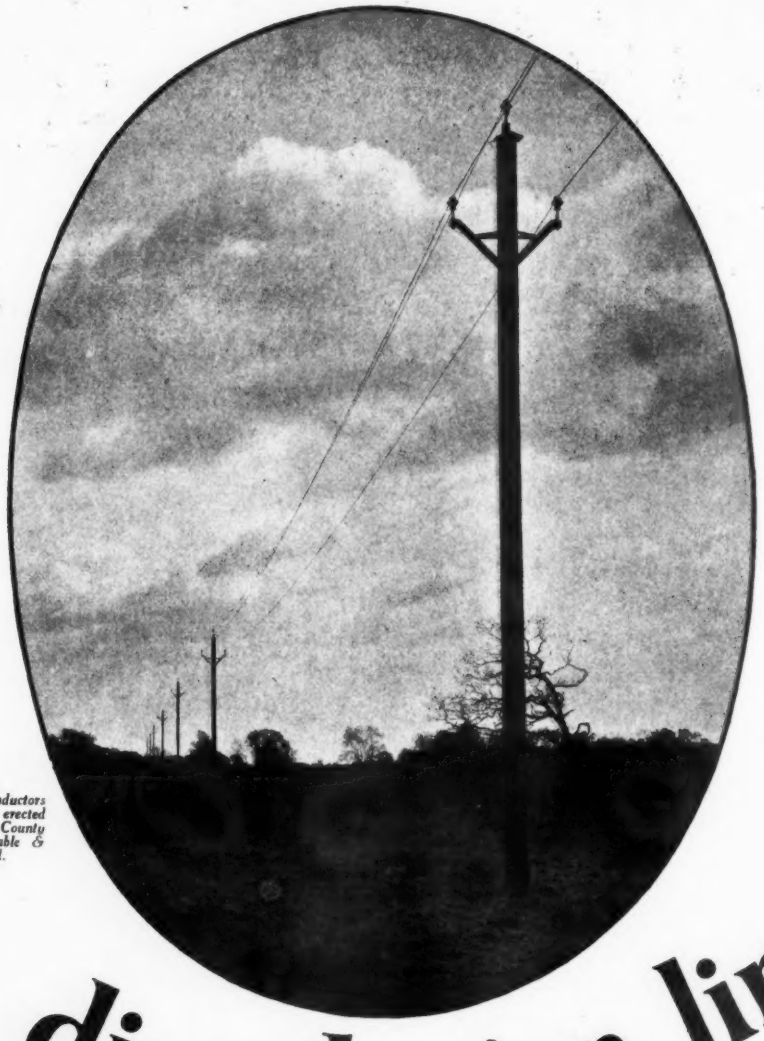

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The
Electrical Review

VOL. CXII. JANUARY 27, 1933. No. 2879

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Efficiency or Efficacy ?

RECENT gas propaganda has brought us many inquiries as to how the cost of electricity really does compare with that of its competitors for various domestic services. The answer is not simple, as electricity, more than any alternative methods, has to justify itself by results. One kilowatt-hour contains only 3,412 B.th.u.; if these cost a penny, for the same sum we can buy (but not use) 10,000 B.th.u. of gas at 10d. per therm, or 60,000 B.th.u. of coal at £2 per ton.

Certain gas undertakings have seized upon this point in issuing statements comparing the heat values of electricity and gas, evidently with the impious hope that the householder will infer that electricity is about three times as expensive as gas. This argument, carried to its logical conclusion, proves too much, since the much greater number of heat units in a pennyworth of coal should rule out both electricity and gas on economic grounds.

The rapid growth of the domestic electrical load provides proof that the householder is quite satisfied that there is a flaw in the argument somewhere, even if he does concern himself with such academic abstractions (to him) as British thermal units. The flaw lies in ignoring the very much superior utilisation efficiency of electricity.

We have from time to time published the experiences of consumers, which have amply borne out this contention. We have evidence that this information has been useful to many of our readers, but the results—satisfactory as the vast majority have been—are broad in outline and do not furnish easily deducible data for preparing a forecast of what may be reasonably anticipated in any given conditions.

With a view to presenting some information of a more definite character, we have got together from various authoritative sources, including official publications, some figures relating to cooking performances. These show that electric ovens have efficiencies of from 66 to 79 per cent., with an average of 70 per cent.; with gas the maximum is 39 and the average 35 per cent. For grilling, one kWh equals 24 cu. ft. (500 B.th.u. per cu. ft.). The percentage efficiencies of electric hot plates vary from 30 to 75.5 as against 32 to 55 with gas. Thus for boiling two pints of water, working tests with electricity have given 58 per cent. for the first boil (0.205 kWh) and 84 per cent. for the second boil (0.142 kWh); gas required 2.36 cu. ft., and an electric kettle 0.13 kWh. Both electricity and gas are very much in advance of coal in utilisation efficiency; tests on closed cottage and open Yorkshire ranges showed figures ranging from 3.8 to 4.81 per cent.

We need further calculations and formulæ for the "utilisation efficiency" of cooking equipment of all kinds on the lines of those given by Mr. A. H. Barker for space heating in his recent I.E.E. paper. The thermal efficiency argument can be, and very often is, harmfully used. It should be limited to strictly technical considerations, as the consumer is concerned only with the quality of the service for a given amount of money.

Who is to Blame?

PURSUING farther the subject of "indifference" among employés of electricity supply undertakings, Mr. W. A. Jones, general secretary of the E.P.E.A., contributes to this issue a survey of the position and suggestions for amelioration. He attributes the stagnation in the matter of promotion largely to the change-over from generation to distribution by a growing number of undertakings. But he thinks that young men contemplating entering the industry, or those responsible for their entry, should have looked ahead, for the signals were obviously against them. It may be argued, however, that they thought that they had a reasonable chance of securing a worth-while post even in the restricted field of generation, for after all there must be somebody ready to step into the places of men who retire or die. In other words, every switchboard attendant feels that he has a "chief's" baton (or its equivalent) in his attaché case. As in other walks of life, the hundreds who fail to reach the top must make the most of things as they are if they wish

to remain on the generation side. On the other hand there is a great field for effort in distribution and sales; men who can adapt themselves to this branch of the industry are badly needed. But their remuneration must be adequate lest they should think that in making the change they are losing caste—which is far from the truth.

Summer and Winter

THE London and Home Counties J.E.A. continues its good work of lowering charges and—what is of almost equal importance—standardising tariffs in the 160 sq. miles of its distribution areas in Mid-Surrey and in the Thames Valley. On Wednesday the Authority considered revisions of tariffs and reductions in hire charges for cookers, to become operative as from the beginning of this year. Consumers in Surbiton and Twickenham will welcome a lowering of the secondary charge in the domestic two-part tariff to the reasonable figures of ½d. in the summer and ¾d. in the winter. A differentiation between summer and winter is justifiable with a flat rate, but would not appear to be an economic necessity under a two-part tariff, in which the effect on the peak demand is presumed to be covered by the primary charge. As the household water-heating load develops under progressive management we may expect that it will be necessary to adopt the same unit rate in the winter as in the summer.

Instruction and Amusement

As a relief from mere talk (not that the discussions are usually dull), last Friday's E.D.A. Conference was treated to a little "play-acting." Mr. Wallace Attwood, in the rôle of electrical salesman, supported by an "all-star" cast, showed the assembly how to sell an electric cooker, first to the expert (in the form of Mr. P. P. Wheelwright), and then to the ordinary lay-woman (Miss Gordon). The aid of a real commissionaire (whose kind is notoriously hard to get over) was enlisted, and we were shown how to win his heart and admission to the presence of the buyer. The whole demonstration was a pretty study of applied psychology, and we are sure that its effect upon the cooker-selling fraternity will be most pronounced.

More Hot-cathode Lamps

THE success of the experimental gaseous-discharge lamps at Wembley, of which an illustrated account was given in our issue of November 11th, has led Capt. J. M. Donaldson to decide to illuminate a mile of the Watford Road by the same means. The existing installation is of 400-W lamps, giving 40 lumens per watt. Motorists who like speed with safety will, within the next six weeks, be able to compare the effect of the G.E.C. lamps with the Philips sodium lamps outside the Croydon aerodrome (our issue of December 9th). The two systems differ in several respects. The Wembley lamps give a whitish light and are operated from the 230-V a.c. mains, whereas those at Croydon (for which an efficiency of 50 lumens per watt is claimed) give an orange light and are run thirty in series from d.c. mains. The reports we have received of their utilitarian value are excellent and we anticipate similar results in the North-Met. area. We hope that other installations on arterial roads will follow in the early future.

No Monopoly

IN an address to the Glasgow University Engineering Society, Mr. G. H. Rowbottom, of the Clyde Valley Power Co., deprecated the custom, prevalent even among engineers, of referring to electricity supply as a "monopoly." Any tendency in this direction is, as he stated, reduced to a controlled concession by the various Acts of Parliament. The Acts can prevent only the worst abuses of authority, and that often in a very cumbrous way. More effective is the consideration that the public does not, except in certain special cases, need electricity as such. It desires certain services for the performance of which other methods are available, including private plants, if the terms on which electricity is supplied are unacceptable. But regard for what our competitors can do is not good enough as an inspiration for progress. There is no industry of which it can more truly be said that the interests of the producer are best served by studying those of the consumer.

Italian Railway Electrification

AN ambitious scheme to be put in hand by the Italian Government will result in the complete electrification within the next twelve years of more than 60 per cent. of the State railways. The new work will involve the equipment of 2,700 route-miles, bringing the total length of the electrified lines up to about 4,000 miles. The primary object of the conversion is stated to be the desire for independence of imported fuel, but probably the word "original" would be better than "primary," as Mr. F. Lydall recently pointed out in the case of the Swedish railways. There is no reason to suppose that, quite apart from politico-economics, electricity will not stand four-square on its own merits in Italy as in Sweden. For our own railways the case has been made out on savings in operation costs without crediting the value of the many advantages that have always followed conversion.

A County Scheme

THE first section of the Dumfriesshire electricity distribution scheme is to be officially inaugurated next Wednesday, when the burghs of Annan and Lockerbie will be supplied by a 33-kV line running from Gretna. Over 200 miles of line have been erected so far, and it is intended to develop the whole county electrically. Mr. J. S. Pickles has to date received over 3,000 applications from prospective consumers. The especial significance of this scheme is that it represents the first occasion on which a County Council has taken out an Order for its entire area. It is another example of the breaking down of the parochial view which has in the past done so much to hinder the progress of electricity supply.

Electricity and Alcohol

ONE would have thought that the sober hard-working electrical men of the United States would have been solidly in favour of the Eighteenth Amendment, but apparently they would regard its repeal with equanimity—not to say enthusiasm. Not because of any bibulous tendencies, however, but because they think that the re-alcoholisation of America will involve a good deal of expenditure upon electrical plant and machinery. Estimates made by the National Electrical Manufacturers' Association, giving chapter and verse, indicate that the possible sale of electrical products which would result from the reopening of the breweries would amount to between $35 and $55 millions, "and the electrical industry vitally needs this business." Thus will one man's poison be another man's meat.

Pure Water

THE influence of drinking water as a carrier of germs that are responsible for ailments that attack so many people at this season of the year is recognised, but electrical methods of destroying such germs are not so much in evidence in Great Britain as they ought to be. Filtration is no adequate prevention, as many of the commonest diseases are due to "filter-passers." Water can be sterilised by heat or by chemicals, but either method is objectionable; there remains purification by electrical methods. A simple yet certain means is the use of ozone, which is produced by electrical discharges through air. The amount of energy required may appear small, but the load in the aggregate should be of a magnitude to make it worth cultivation.

The New Wing of the London County Hall

1. A committee room. 2. The conference hall (the central fitting weighs 8 cwt.). 3. A handsome staircase. 4. The head of the main staircase. 5. Part of the air-conditioning plant. 6. The main switchroom of Section D

The London County Hall Extension

THE extension (Section D) of the London County Hall, which is to be officially opened by the Chairman of the Council, Mr. Angus N. Scott, J.P., to-day, includes a conference hall, motor licensing department, library, committee rooms, public galleries, and offices.

The electrical work was begun in 1931, and its scope may be gauged from the material used, which includes eighty-six miles of wires and cables, thirty-three miles of solid-drawn steel conduit, and 8,000 ft. of 3-in. steam barrel for the main cables. Some 3,000 lighting points and 350 electric clock points have been wired, 1,100 automatic telephones, and some bells have been provided. The power installation includes four passenger, four book, and one goods lifts, forced-draught and extraction fans for ventilators, pumps, compressors, and vacuum plant. Three-phase four-wire supplies at 400/230 V for lighting and 460-V d.c. supply for power are taken from the London Electric Supply Corporation. Auxiliary lighting is supplied from a three-wire d.c. service at 400/200 V, which is automatically raised to 420/210 V when the load exceeds 50 A.

The main cables, from the switchboards in the basement sub-station, are carried by horizontal and vertical ducts of 3-in. steam piping to lighting distribution boards in eight control rooms on the various floors. These distribution boards are provided with twenty-four pairs of 15-A fuse units mounted on 4-in. by 2-in. vertical channel-irons. Thence the wiring is carried in conduit run in ducts in the corridors and concealed under the floors. A number of special lighting fittings to the design of the architects have been used. The Osler & Faraday fitting (10 ft. in diameter) in the conference hall, containing one hundred and ten 100-W and eight 150-W lamps and weighing 8 cwt., is especially noteworthy. This hall, which is in the centre of the north courtyard, is elliptical in shape, and is also illuminated by ten laylights each containing eleven Benjamin reflectors.

Below the conference hall is the new motor licensing department, and above is the education library. In the latter the illumination from a central laylight is supplemented by local lighting in the recesses housing the bookshelves. In the decoration of the new wing the somewhat ponderous appearance of the old building has been avoided, and it has been possible to make more effective use of reflected light. The Kye lamps used were supplied through the L.C.C.

The entire electrical installation was carried out by Messrs. Alex. Hawkins & Sons under the supervision of Mr. F. J. Hawkins, one of the partners. Mr. George Dixon, who has to his credit over thirty years' service with the firm, was in charge of the constructional work.

The principal manufacturers of electrical apparatus were :— Lighting fittings, Best & Lloyd, Ltd., Edison Swan Electric Co., Ltd., Galsworthy, Ltd., General Electric Co., Ltd., James Gibbons, Ltd., Alexander Hawkins and Sons, and Osler & Faraday, Ltd.; lantern lights, Pennycook Patent Glazing Co.; electric motors, Laurence, Scott & Electromotors, Ltd.; motor switchgear, Brookhirst, Ltd.; main and distribution switchboards, Dorman & Smith, Ltd.; main and distribution cables, W. T. Glover & Co., Ltd.;

The new wing of the London County Hall

lifts, Waygood-Otis, Ltd.; clocks, Gillett & Johnston, Ltd.; air-conditioning plant, Carrier Engineering Co., Ltd.; circulating pumps, Gwynnes Pumps; vacuum cleaning plant, British Vacuum Cleaner & Engineering Co., Ltd.

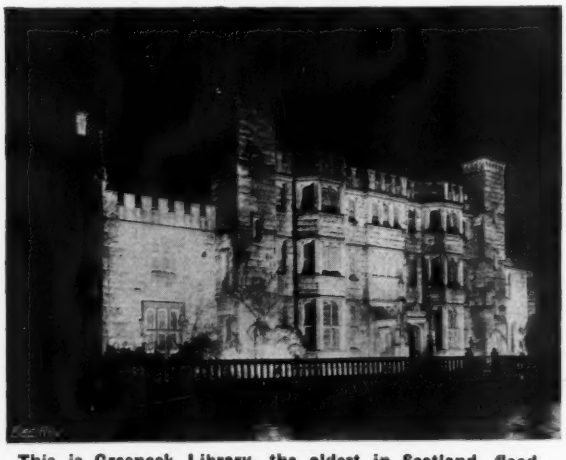
The architects were Messrs. E. Stone Collins & Llewellyn Roberts. The specifications for the electrical work were drawn up by Mr. C. A. Baker, M.I.E.E., divisional engineer of the L.C.C., and the erection has been supervised by Mr. H. G. Witham, the resident engineer.

Barreters. By R. L. Spiller, B.Sc. (Lond.)

IT seems strange that such a useful piece of apparatus as the "barreter" tube should be so little known and, in consequence, so rarely used. This automatic current regulator is not only effective and trouble free, but also inexpensive and has an almost indefinite life. In construction it resembles an ordinary electric lamp, except that the "filament" is made of iron and runs in an atmosphere of hydrogen.

In its operating range a barreter passes a constant current irrespective of the voltage across its terminals. Thus when inserted in series with a load, small changes in the applied voltage are absorbed by the tube, and no change in current results. Similarly, small changes in the load, resistance, or back e.m.f., do not alter the current within working limits.

These properties depend on the fact that an increase in applied voltage results in a momentary increase in current, with a consequent increase in the temperature of the filament.



This is Greenock Library, the oldest in Scotland, floodlighted in celebration of its 150th year

Due to the rapid rise of the specific electrical resistance of iron with temperature, the resistance of the filament increases and the current then falls. In a suitably designed tube the increase in resistance is exactly proportional to the increase in applied voltage, and the current returns to its original value. The characteristics of the tube therefore depend upon the temperature-resistance coefficient of iron, and also upon the watt-temperature characteristics of the filament, which latter are influenced by the density of the atmosphere in which the filament operates. Hydrogen at a suitable pressure has the desired properties, and prevents the iron from oxidising.

A barreter will maintain constant one predetermined current value only. Should it be desired to pass a smaller current through the load, the latter must be shunted, with consequent waste of power. At the same time there is no reason why barreters, even of different current capacities, should not be used in parallel provided only that they have the same voltage range. Alternatively, barreters of the same current capacity, even of different voltage ratings, may be used in series. In this way the current capacity or voltage range of the combination respectively may be varied to suit the circumstances.

Since barreter tubes utilise the main current for their operation, they are not very efficient for the control of large currents. Nevertheless, the problems to which they may be applied are numerous, and the few examples mentioned below will serve to illustrate their possibilities. In a battery trickle charger, actually placed on the market, a barreter tube was placed in series with the output terminals, so that a charging current of 1.3 A was maintained irrespective of the state of charge of the batteries, and of whether a 2-, 4-, or 6-V battery was connected to it. Another use for a barreter is in controlling the filament current in radio valves, where it is desired to avoid the effect of variation in voltage due to the state of charge or discharge of the battery. Barreters may also be employed to control the temperature of electric furnaces, so that they are unaffected by variations in line voltage. It is essential in this case, however, that the current-temperature characteristics of the furnace be undisturbed, since the opening of the door, for example, would result in a different temperature although the current was unaltered.

A Pumped Storage Power Scheme

AN interesting pumped-storage plant is at present in course of construction in France by the Société de l'Energie Electrique du Rhin, which was responsible for the erection of the recently opened large power station at Kembs on the Rhine. The purpose of the Lac Noir installation is to handle peak loads and, as considerable excess energy will be available during the night, to provide water storage artificially by means of pumps.

West of Colmar, almost on the main watershed of the Vosges, are the two natural lakes Lac Blanc and Lac Noir about five-eighths of a mile apart, the mean difference in head being 357 ft. The favourable conditions of the site and, moreover, the relatively small distance from the Kembs-Troyes transmission line, decided l'Energie Electrique du Rhin to build an accumulator station at Lac Noir, and a subsidiary concern known as the Société Hydroélectrique des Vosges (HYVO), with head offices in Mulhouse, has been formed to take over the business control of the plant.

The water flows from Lac Blanc through a tunnel of a cross section of 18 ft. and then *via* a 15-ft. pipe-line laid in a tunnel cut through the rock, through the turbines into Lac Noir, the water after passing being pumped back into Lac Blanc. The maximum variation in the water level of both Lac Blanc and Lac Noir is approximately 60 ft. As the installation is intended for daily accumulation, these large variations can often occur in the smaller reservoir, Lac Noir, in certain circumstances almost every day, whereas in the upper, larger reservoir the daily replenishment may be supplemented by a seasonal one. The water flowing up and down daily ranges between 242 and 308 million gallons, which, using the maximum capacity of the turbines, can be discharged in about four hours. The pumping periods during the night and at midday last about twice that time.

The Pipe-line and Power House

The complete equipment of the control room and the entire pipe-line are being supplied by the Société Alsacienne de Constructions Mécaniques of Mulhouse and the Escher Wyss Co. of Zurich, working in co-operation. The water is led through the control room by two welded steel pipes, each 10½ ft. in diameter. In each pipe-line, two throttle valves are inserted, which can be either electrically or manually operated. Further, each throttle valve is equipped with a drop-weight, which is automatically released on any danger threatening the station and shuts the valve. Two pipe-lines were used in order to avoid too large valves and to obtain rational water-flow measurement. They unite in a circular concrete conduit, 18 ft. in diameter, leading with a gradient 1.25 per cent. to the surge tank. The latter is of the nozzle type with a weir built in the upper part, the internal diameter of the shaft being 42½ ft.

The power house will eventually contain four sets, each consisting of a pump, a turbine, and a generator mounted vertically above each other in the order mentioned. The generators, each rated at 25,000 kVA, 12,000 V, built by the Alsthom Co., will be coupled to Escher Wyss Francis-type turbines, each developing 24,000 h.p. at a maximum net head of 278 ft. At high head the output can be adjusted to correspond to the capacity of the generators, each turbine being able to develop a maximum of about 40,000 h.p. According to the outside temperature, the generators can be heavily overloaded for short periods, a matter of importance for a peak-load power station. There will be three centrifugal pumps, each with a mean delivery of 2,860 gallons per second and requiring a driving power up to 27,000 h.p., and a centrifugal pump for 1,760 gallons per second. The normal speed of all sets is 272.7 r.p.m.

The turbines operate at low level with suction head and at high level with back pressure. A new aspect in the construction of power plant is the peculiar arrangement of the generators. In recent years the rule of installing the generators above the highest tail race level had been given up, the power house floor having been lowered by several feet in most cases. However, at Lac Noir it was decided to place the generators 32 ft. below the highest level in the lower lake. In this way considerable space was saved. Thus, at high water level the whole turbine room is completely submerged and only the transformer station and the switchgear are permanently above water. This has necessitated special facing for the building.

Permanently Coupled Pumps

Another new feature is the manner of coupling the pumps. Hitherto storage plant pumps have been uncoupled whilst the turbines are in operation and connected up when necessary by hydraulic couplings. At Lac Noir it was decided to omit declutchable couplings of this type, as otherwise considerably deeper excavations would have been required. During turbine operation the rotor of the pump therefore runs light. The water is expelled from the pump volute by compressed air and maintained at a certain height in the draught tube by means of an automatic float device, the air pressure in the pump casing advancing with increasing water level. Whilst the pump is working, the turbine is emptied in a similar manner.

Each set has its own compressor with direct motor drive, together with two air tanks for a pressure of 25 atmospheres. The latter can all be interconnected, so that no interruption in operation would be caused by the breakdown of any one compressor. All the rotating parts, *i.e.*, the electrical rotor, the turbine runner, and the pump impeller, are supported by a single thrust bearing mounted on the upper spider of the generator. In order to shut off the water from the turbines and the pumps, Escher Wyss spherical valves are employed. The servo-motors are operated by water taken from the pipe-line and provided with a preliminary oil pressure-operated control mechanism. The remote control is electromagnetic.

The regulation of the station is automatic, a hand lever on the switchboard enabling any desired operating condition, either from rest or any running position, to be obtained, *e.g.*, either the pump, turbine, or phase shifter may be put into action. The load on the turbine and the discharge from the pump will be controlled by push-buttons on the switchboard during the initial period of operation. The whole control gear is, however, so arranged as to facilitate a change over to remote control without extensive alteration at some future date.

Some Driving Forces in the Industry: Isenthal & Co., Ltd.

1. Mr. A. W. Isenthal, managing director (*Elliott & Fry*). 2. Mr. E. L. Straub, production engineer. 3. Mr. W. C. G. Hardy, first engineer (*Elliott & Fry*). 4. Mr. F. H. McCrea, sales director (*Elliott & Fry*). 5. Mr. C. Holt Jones, testing department (*Connaught Studios*)

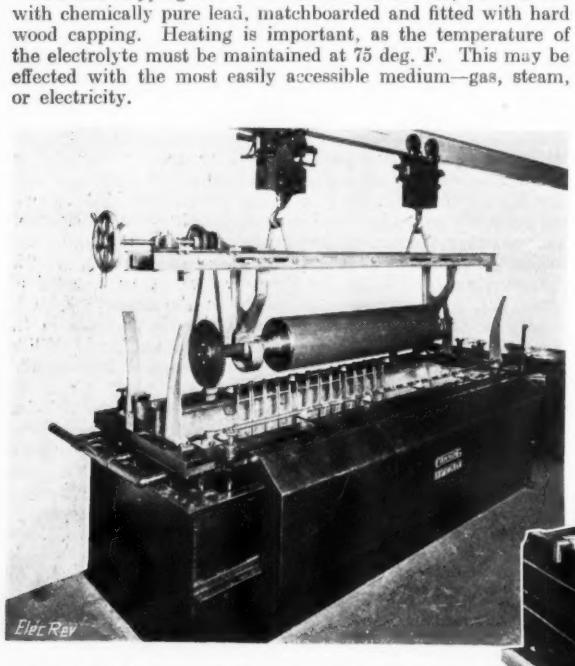
Electro-deposition in Printing

Modern methods and appliances

ELECTRO-DEPOSITION has been used in the printing trade ever since the introduction of electrotyping. Since then it has made progress in nickel-facing half-tone engravings, and later in nickel-facing all flat printing plates for greater hardness to resist the extreme pressure of modern printing machinery, and to stand up to the ever-increasing runs on illustrated work.

Modern electrotyping equipment has considerably reduced the time taken to produce a good shell. The requisite d.c. is obtained from a mains-driven motor-generator wound for separate excitation, and the voltage is controlled by a shunt regulator.

The electrotyping vat is constructed of timber, lined inside with chemically pure lead, matchboarded and fitted with hard wood capping. Heating is important, as the temperature of the electrolyte must be maintained at 75 deg. F. This may be effected with the most easily accessible medium—gas, steam, or electricity.



The nickel-facing of flat plates has been in vogue for some few years now, and later practice and solutions ensure a facing to half-tones, electros, and stereos much harder than copper or stereo metal; in fact, they are practically as hard as steel.

Big Saving in Costs

A very great number of runs is consequently obtainable, with a big saving in cost. A London newspaper company saves 300 casts per week by nickel-facing its page stereos. The life of an ordinary plate is limited to 20,000 to 40,000 impressions; when nickel-faced approximately a million copies may be obtained. This, of course, means great economy in the cost of renewal of plates, and sustained delicacy and beauty of the print throughout the job. Nickel-faced plates take the ink well, and give a clear impression.

Nickel-facing is of great importance in colour printing from half-tones, electros, and stereos, as it ensures the correct tone in the reds, the brilliancy of which is lost through chemical action by printing from copper surfaces.

The process of nickel-facing only differs from ordinary nickel-plating in that plates other than copper must receive a light coating of copper before being placed in the nickel-plating vat. When sufficient copper has been deposited the plate is placed in a vat charged with "Facix" solution, which produces a very hard coat of deposited nickel; it is then swilled through cold and hot water, allowed to dry, and is ready for mounting and finishing. Copper shells are, of course, merely cleaned in the customary manner and nickelled straight away.

Chromium Facing

For very exceptional jobs, embracing excessive runs, the plates are faced with chromium, the latter giving intense hardness, and enabling an indefinite number of impressions to be printed without loss of definition. Chrome-facing also possesses marked resistance to corrosion, thus permitting a wider choice of inks. There is no loss of definition when the finest half-tone is chrome-faced, and for colour plates it is perfect, as there is no change in the tone value of inks of any manufacture.

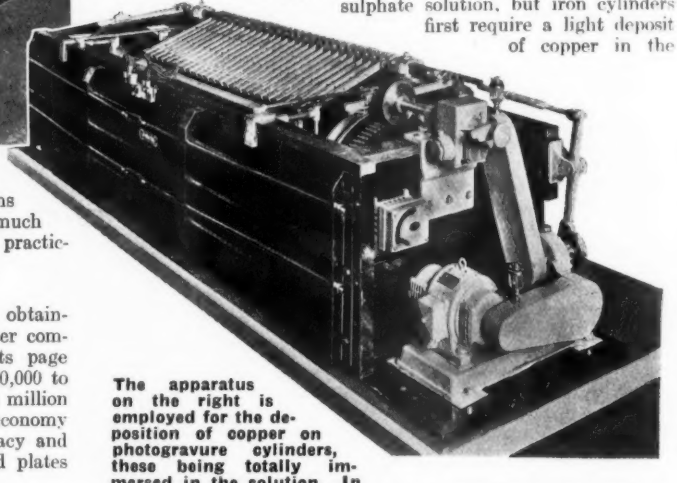
Chrome-facing is a special process demanding exact adherance to instructions. A specially designed tank is used, which is provided with an outer water jacket for heating purposes by steam, gas, or electricity. The problem of dealing with the fumes evolved during the process of deposition is effectively solved by means of a system of fume exhaustion and condensation whereby the fumes are drawn off and the solution content recovered. This is done without impeding the working of the vat. The vat is also provided with loose glass sides to act as an insulator for the anodes and the cathodes.

Application to Rotary Printing

The foregoing remarks apply generally to flat plates, the next step being copper-depositing on cylinders for rotary printing. This subject has received great impetus resulting from the growth of photogravure, and is now carried out to the satisfaction of printers employing this exacting process. Porosity of the deposit and subsequent stripping from the cylinder under printing pressure are both absent from the modern process of electro-deposition, and the deposit has a close grain and a surface as smooth as glass.

Two forms are used in which (*a*) the cylinder is totally immersed in the solution, and (*b*) the cylinder is partially immersed. In the first type cylinders of any diameter and length may be dealt with. Improved methods of burnishing have been introduced in which a number of agate burnishers gives greater efficiency in preventing the growth of nodules. The reciprocating burnishing gear is readily moved for the purpose of loading and unloading cylinders. The vat is constructed of timber, lined inside with chemically pure lead. The cylinder is mounted on supports, and is provided with special roller bearings.

The rotary motion is obtained by spur gearing, which engages when the cylinder is immersed in the vat, and is operated by a motor. The thickness of deposit and time taken in deposition varies considerably according to methods of working and current density employed in different shops. Copper cylinders receive the deposit in a copper sulphate solution, but iron cylinders first require a light deposit of copper in the cyanide copper solution before being placed in the copper sulphate solution.



The apparatus on the right is employed for the deposition of copper on photogravure cylinders, these being totally immersed in the solution. In our left-hand picture is seen a chrome-facing machine in which the cylinders are given a final coating of chromium which imparts to the metal a surface harder than steel

Partial Immersion

In the second type of apparatus the cylinder is immersed in the solution to a depth of approximately one-third its periphery, but no fittings are allowed to enter the solution. The cylinder revolves in ball bearings, and is supported on strong cast-iron legs positioned clear of the vat at each end. The cylinder mountings are constructed so as to be adjustable for length.

Rotary printing, of course, is not confined to photogravure, and developments are in progress with offset printing, as instanced in the "Pantone" process, in which electrolysis plays a big part. The tendency, however, in the employment of such heavy fast-running presses is to rely upon a final deposition of chromium, as being the hardest face that can be obtained.

The binding of this deposition to the base metal is done in a variety of combinations, including copper, nickel, and even silver.

Small A.C. Motors. By S. F. Philpott, A.M.I.E.E.

Machines not exceeding ⅛ h.p. capacity

THE series commutator motor is usually sold as a "universal" machine (*i.e.*, suitable for either d.c. or a.c. operation) for driving mass-produced domestic appliances such as vacuum cleaners, hair dryers, &c. The only difference between the series motor for d.c. only and the universal model is that the field system of the latter is laminated and is either weaker or is tapped so that fewer turns are in circuit. Unless the winding is especially arranged the a.c. output is generally less than the d.c. The performances are more nearly identical in high-speed motors, such as vacuum cleaners, than in slow running machines, such as gramophone motors.

It is difficult to obtain a satisfactory 230-V universal motor running at much less than 3,000 r.p.m. Below this speed it is better to wind the motor for a lower voltage and use an adjustable sliding resistance. In very slow running motors the a.c. voltage may have to be more than twice that of the d.c. to give the same horse-power output. Series wound motors exhibit a good starting torque. They have a steeper speed load characteristic than corresponding d.c. machines.

The bad sparking which used to be a feature of early universal motors when used on a.c. has now practically disappeared, due to improved designs and the production of suitable grades of brush. A.c. series motors can be made for any

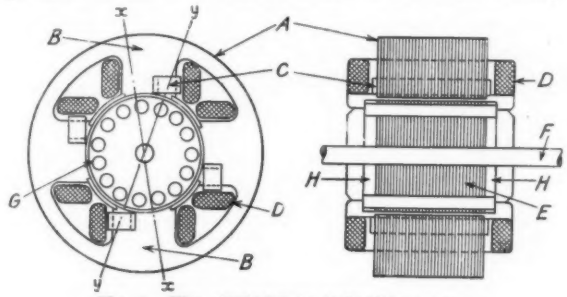


Fig. 1.—The shaded-pole induction motor

output down to the smallest required. One universal motor on the market has an armature less than ⅛ in. in diameter and only ⅛ in. long and works directly from the mains. Universal motors are not generally made above about ¼ h.p.

Split-phase Start Induction Motors

The circuits to which motors of ¼ h.p. or less are connected are invariably single-phase, but the single-phase induction motor cannot compare either in performance or construction with its three-phase counterpart as it has no truly rotating field; if wound with four coils only (in a four-pole motor) it is not self-starting.

To provide starting torque an auxiliary winding, on the stator in parallel with the main winding (but with different values of reactance and resistance), causes the magnetic centre line to pulsate through an arc of 45 deg., cutting the conductors of the squirrel-cage rotor. The auxiliary coils are in series with a centrifugal switch which cuts them out of circuit when the motor is up to speed. The modern type of split-phase start motor has a good starting torque and overload capacity, the former varying between 100 and 200 per cent. of full load and the latter up to 100 per cent. The starting current of this type of machine is about four times full-load.

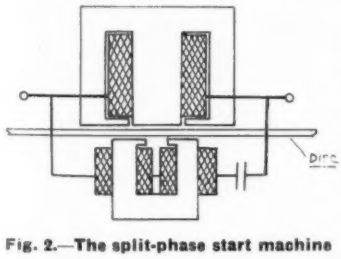


Fig. 2.—The split-phase start machine

The smallest frame on the market at present is 1/20 h.p., but smaller machines will no doubt be developed in the near future as a distinct demand for them exists. Split-phase start motors run very close to the synchronous speed, about 1,450 r.p.m. being usual for ¼ h.p., and 1,350-1,400 r.p.m. for 1/20-h.p. machines.

Repulsion-start Machines

The development of the small repulsion-start motor is mainly due to the introduction of the domestic refrigerator. Here the starting torque must be powerful to enable the motor to get away against the compressor load, and the starting current must be limited so as to obviate flicker on the house lights.

The repulsion-induction motor gives a starting torque of four or five times full load with a current of only about twice full-load. This motor comprises a four-pole single-phase stator, and instead of a squirrel-cage rotor a wound armature with commutator is fitted. The mains are connected to the stator only and the four brushes on the commutator are short-circuited.

The machine thus starts up as a repulsion motor, and as

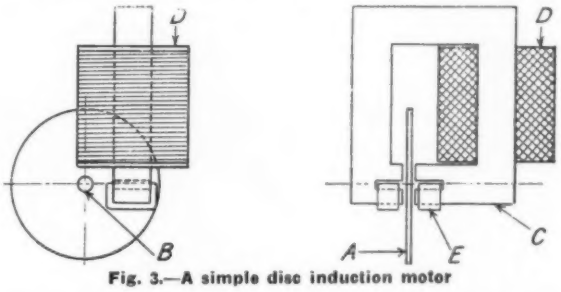


Fig. 3.—A simple disc induction motor

such has a series characteristic. When a predetermined speed is reached a centrifugal device operates a switch, short-circuiting all the commutator segments and at the same time lifting the brushes. The machine is then virtually a single-phase induction motor with a wire-wound instead of a squirrel-cage rotor. Owing to its rather complicated construction this type of motor is much more expensive than other classes of small a.c. motors, and apart from refrigerator work is very little used.

The Shaded-pole and Disc Types

Specially developed types are all of very small h.p., and cheapness is an essential feature. Efficiencies and power factors are of secondary importance, owing to the very small energy consumption of such machines.

For small power drives of 1/100 h.p. or so where a steady speed, reasonably good starting torque, and simple, robust, and cheap construction are demanded, the shaded-pole start induction motor is recommended. The construction of this form of motor is shown in fig. 1, in which A is the stator built up of laminations riveted together having four internal poles, B. A portion of each pole is surrounded by a copper band, C. Each pole has a coil, D, giving poles of alternate polarity. The coils are normally connected in series. The squirrel-cage rotor follows standard practice: F is the shaft, E the stampings, G the copper bars, and H the copper end-rings into which they are sweated. A die-cast aluminium squirrel cage is often employed instead of the built-up copper construction described.

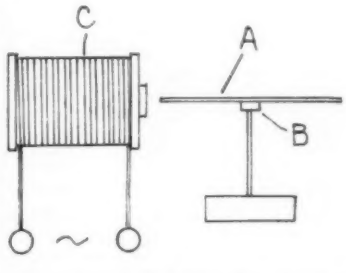
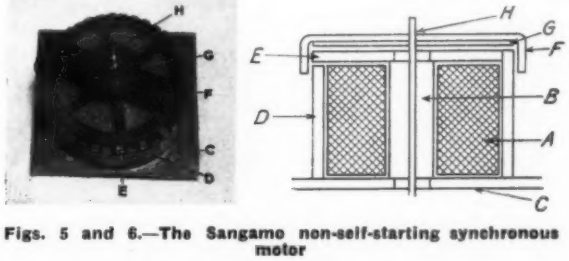


Fig. 4.—The principle of the small synchronous motor

The effect of the copper bands is to retard the growth of the magnetic flux in the portion of the pole that they surround, so that the flux becomes a maximum first along line *xx*, then an instant later along line *yy*. Thus a pulsating flux is produced which enables the motor to start. The starting wind-

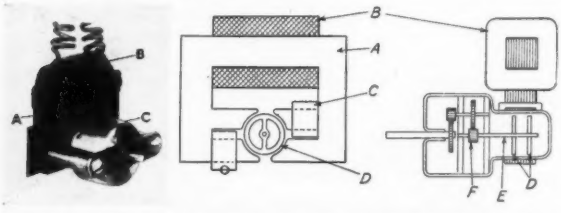


Figs. 5 and 6.—The Sangamo non-self-starting synchronous motor

ing, represented by the copper bands, remains in circuit continuously, and thus the efficiency is low, but, in view of the small size of the motor, this is of little importance. Shaded-pole motors are much used for a.c. fans and gramophone motors. Their speed is usually from 1,200 to 1,300 r.p.m. for

four-pole machines on 50-cycle circuits, and they can be braked down considerably without losing appreciable torque.

The disc-type motor (fig. 3) is probably the simplest form of induction motor existing. It consists merely of a copper disc, A, mounted on a spindle, B, running between the poles of a laminated magnet, C, energised by coil D. Each pole is split and half surrounded by a copper coil band to give a rotating field in the manner previously described. The motor has a low efficiency, but is cheap. Among other applications, it is used to drive gramophone turntables and sign flashers.



Figs. 7 and 8.—The Warren self-starting synchronous model

Larger and more powerful motors of this type are fitted with one or more pairs of separately energised magnets above and below the disc, as shown in fig. 2, the phase of the current in the top half being different from that in the lower, thereby giving the necessary starting effort. This phase difference is frequently obtained by the insertion of a condenser in the circuit of one of the magnets. Disc induction motors run at considerably below synchronous speed, and can be braked mechanically to as low as 70 r.p.m. as for gramophone turntables.

Synchronous Motors

Small a.c. synchronous motors have come to the fore comparatively recently. Their application at the present time is confined mainly to mains-operated electric clocks, gramophone motors, and telegraphic synchronisers. Their chief advantage is that the speed, which is controlled by the periodicity of the mains, is absolutely constant from no load to the maximum that can be applied before stalling. They are usually very simple in construction and therefore cheap.

Synchronous motors fall into two classes, *viz.*, self-starting and non-self-starting. Fig. 4 indicates the principle of the non-self-starting type. A is a magnetic compass needle, pivoted at B, and C an electric magnet energised from the a.c. mains. Each pole of the compass needle is alternately attracted and repelled by the magnet, and consequently, on being given a spin by hand, rotation will ensue.

Figs. 5 and 6 represent a commercial application of this principle, both illustrations being lettered to correspond. A is the coil, mounted on core B, the plate E representing one pole of the magnet, and steel plate C and tube D the other. Plates D and E are so notched as to give a ring of alternate north and south poles, over which swings magnet F mounted on plate G and spindle H. The magnet moves from one stator pole to the next every half cycle; thus the running speed of a synchronous motor is given by the formula: $= \frac{2 \times f \times 60}{\text{no. of poles}}$ Thus the running speed of a 30-pole motor is 200 r.p.m. at 50 cycles.

A typical example of a self-starting type of synchronous motor is the Warren motor shown in figs. 7 and 8. A is a laminated magnet core having two poles, half of each being shaded by the copper band C; B is the exciting coil. The rotor, D, consists of two discs of hardened steel mounted on spindle E. Magnetic poles are induced in the rotor, and, owing to hysteresis effects, these persist, and the rotor is dragged round as the polarity of the various portions of the poles change. This being a two-pole machine, the rotor runs at 3,000 r.p.m.; the speed of the output spindle is reduced by gearing F.

There remains one other class of small a.c. motor, that in which the rotation is obtained from the vibratory motion of an armature working in conjunction with an a.c. electromagnet. Fig. 9 illustrates the principle. A is a wheel mounted on spindle B. C is a rubber tip mounted on an extremity of armature D, pivoted at E. When the magnet F is energised with a.c. the armature vibrates in unison with the frequency, and, in so doing, wheel A is pushed round in the direction of the arrow. A back stop, G, prevents the wheel from running back on the upward stroke of the driving tip. This type of motor allows a fairly slow output speed to be readily obtained with few rotary parts.

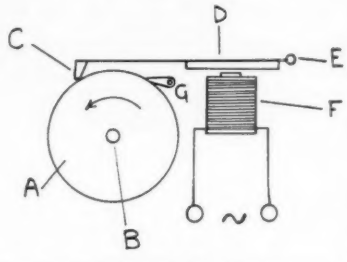
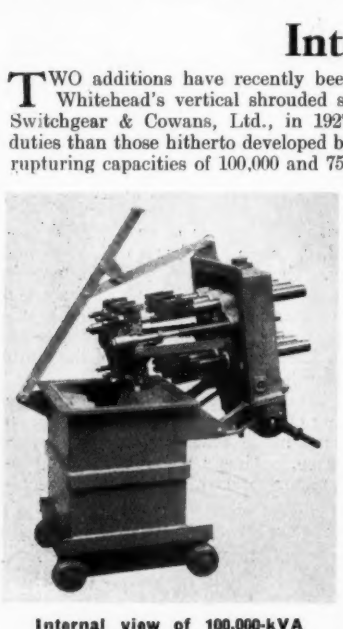


Fig. 9.—Principle of the vibratory a.c. motor

Internal Isolation Switchgear

TWO additions have recently been made to the range of Whitehead's vertical shrouded switchgear introduced by Switchgear & Cowans, Ltd., in 1927; these are for smaller duties than those hitherto developed by the company, and have rupturing capacities of 100,000 and 75,000 kVA at 11 kV. For rupturing capacities of 50,000 kVA and under it is held that the system offers no marked advantages.



Internal view of 100,000-kVA switchgear

In the development of this line of switchgear Whitehead's Patent No. 286429 was followed by Switchgear and Cowans' Patent No. 328249; in its present form (dating from 1929) it is known as the S. & C. internal isolation switchgear (Whitehead system).

The most recent models retain the fundamental principle of isolating the circuit breaker without moving it, but differ materially from the original conception, in that first, the switchgear is metal-clad and compound-filled; secondly, the terminals of the circuit breaker are themselves the isolating plugs, thereby eliminating the extra set of contacts required by a separate isolator; and thirdly, the circuit breaker rests on the ground. The last departure eliminated the mechanism and other provisions for raising and lowering the circuit breaker, or racking it backwards and forwards, and reduced interlocking to a minimum. The supporting stands, no longer required to carry the weight of the circuit breaker or to withstand the mechanical shocks due to rupturing short circuits, were considerably lightened and the whole switchgear assembly, including housing and foundations, was reduced in size, weight and cost, while improvements were made in many respects to the purely electrical qualities.

The design of the new models follows closely that of the larger capacities of internal isolation switchgear; the most noticeable difference is that the current transformers, being smaller and lighter, are housed in one oil or compound-filled plug-in chamber instead of three. Switchgear & Cowans, Ltd., inform us that sixty-seven per cent. of their orders for internal isolation switchgear are repeat orders, and that there is no record of any failure under either normal or faulty service conditions.

A four-panel three-phase switchboard; 300 A, 75,000 kVA

A Peak-load Station. By R. N. Tweedy

The conservation of old capital by new devices

DURING its thirty years of service over £1¼ million has been expended upon buildings and plant in the Pigeon House generating station, Dublin. A very large proportion of this capital had been amortised before the Electricity Supply Board took over all the assets and liabilities of the undertaking. At that time there were three 5,000-kW and two 3,000-kW sets installed, but during the construction of the Shannon power works the Board was forced to install an additional 10,000-kW set, making the total installed capacity 31,000 kW; that total is somewhat illusory on account of a shortage of boiler capacity amounting, apparently, under the most favourable conditions, to the equivalent of about 5,000 kW. Ten boilers are thirty years old.

To Mr. L. J. Kettle and his power station superintendent, Mr. McKeown, is due the chief credit that this old station can be called upon to supply from 20,000 to 25,000 kW at very short notice. Mr. McKeown retains his position under the new regime, while Mr. Kettle occupies the position of technical adviser to the Board. Since the advent of the national supply undertaking Dipl. Ing. Hahn has been responsible to the Board for generation and transmission in the area, and I am indebted to him for the information contained in this article, given by special permission of the chairman of the Board.

The Free State's Generating Capacity

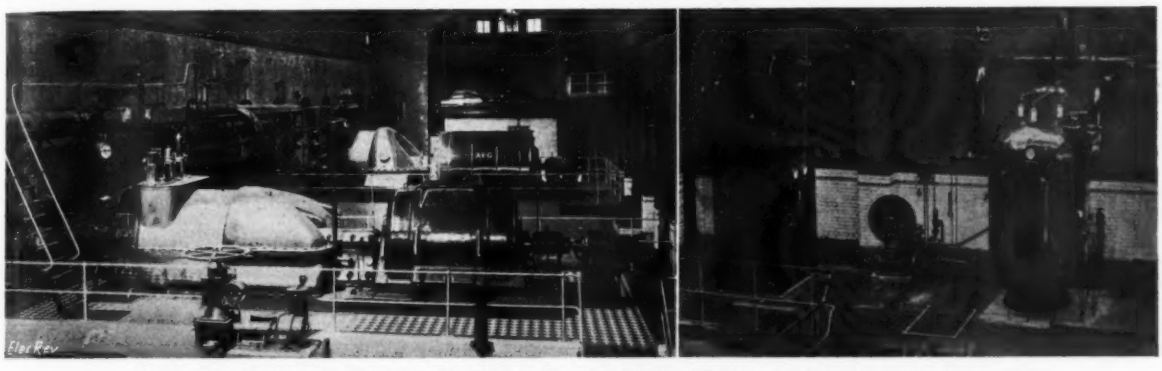
The supply of electricity over the whole of the Irish Free State is derived from the following sources:—(*a*) Ardnacrusha, Limerick (water power), three sets each of 21,000 kW at 0.7 p.f.; (*b*) Pigeon House, Dublin (steam), six sets, 31,000 kW; and (*c*) Cork (steam), 5,000 kW; a total of 99,000 kW. Neither the boiler capacity nor the capacity of the trunk mains are sufficient to cater for a load of 31,000 kW from the Pigeon House but the importance of this component of the national undertaking is so great that the discrepancy is likely to be made up in the near future.

Popular belief notwithstanding, neither the expert advisers of the Government nor the Electricity Supply Board ever contemplated abandoning the Pigeon House station. The progressive development of the Shannon Scheme included its conservation as an important adjunct. During the first year or two peaks were not sufficiently high to warrant the recommissioning of the steam plant, although it was maintained always in readiness, but last year demand had grown to such a degree that the coal-pile became once again an important factor in the production of energy; not now for Dublin alone, but for the whole of the Free State.

A 2,500-kW electric boiler was put down as the second step towards converting the station into an efficient peak load station; the first step having been to equip four of the more modern boilers with oil burners for quick starting and increased steaming capacity. This "Penzold" system electric boiler (A.E.G.) takes surplus energy from the base-load water-power station 120 miles away. This energy is delivered through the Dublin-Pigeon House trunk mains at 5,000 V, and its prime function is to keep the long and very wasteful steam ranges "hotted up" against the time the signal comes through from Ardnacrusha that the first steam set is to go into action. Before the advent of this mammoth electric kettle one of the coal-fired boilers had to be kept under steam continuously.

Rapid Recovery of Cost

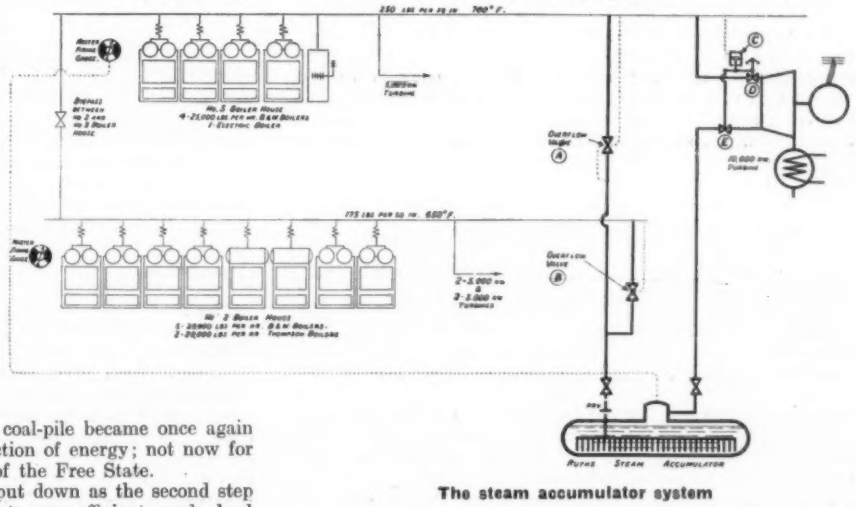
So important is the economy attributable to the waste-power electric boiler that the capital charges will be extinguished in eighteen months, even though the boiler is used only during half the year. The boiler is rated at 6,900 lb. of steam at 250 lb. per sq. in. Midway between the boiler and the switchboard is a little pump with a diaphragm controlling device which adjusts the electrical input to the boiler by varying the water level; this is claimed to be a better method than raising and lowering the electrodes.



(Left) The generating plant at the Pigeon House station. (Right) A 2,500-kW electric steam boiler

The third step towards the goal of evolving a peak load station was guided by the facts that: (*a*) boiler capacity was well under turbine input requirements; (*b*) eight of the boilers supplied the older plant at 175 lb. sq. in. and 650 deg. F., while four others supplied the 5,000- and the 10,000-kW sets at 250 lb./sq. in. and 700 deg. F.; (*c*) the electric boiler supplied only saturated steam, which could not be delivered to the primary stages of the turbines; (*d*) the system peak is exceedingly steep and short-lived. A Ruths' steam accumulator which would absorb steam from the steam ranges indiscriminately, but would release it only to the 10,000-kW set, was installed. Clearly then that increases greatly the scope of the electric waste-power boiler, saves the purchase of an additional boiler, eases enormously the peak-load strain on the staff and the steam-raising plant, and provides the ability to make an emergency start without keeping any boiler under steam.

The accumulator is 70 ft. long by 14 ft. 9 in. diam., and is placed horizontally. Heat insulation consists of 3¼ in. of 85 per cent. magnesia, covered with ¼ in. of hard-setting composition forming a weather-proof cover, the accumulator not being housed in a building. It has a working pressure range of 200 to 45 lb./sq. in., and a volume of 11,100 cub. ft. It is designed to develop in the 10,000-kW turbine set 3,750 kW over a period of ninety minutes with a peak of 5,000 kW. By



The steam accumulator system

means of the regulating system the 10,000-kW set can take simultaneously 5,000 kW of steam from the live-steam range at full pressure and temperature and up to 5,000 kW of dry saturated steam at 200 lb./sq. in. from the accumulator.

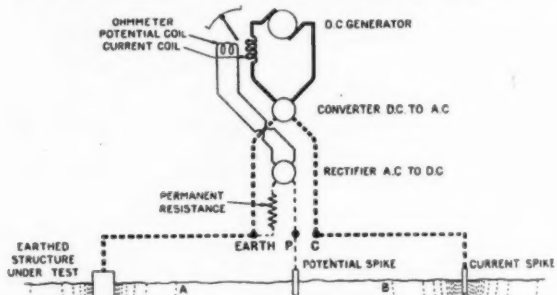
Summarising the neat solution of this special problem we have (1) A waste-power electric boiler keeping the steam ranges hot and storing heat in the accumulator. (2) Almost instantaneous response to an emergency call, giving ample time for the oil-fired boilers to be run up from cold to steam-line pressure. (3) The old low-pressure boilers (previously only capable of supplying the oldest plant) can now supply the most efficient set through the accumulator. (4) The postponement of the purchase of new boiler units until the substitution of a large modern unit for the numerous small and relatively inefficient units may be considered. (5) Improved load conditions at the base-load station and on the transmission lines.

Many of the fittings for the overhead distribution lines have been made at the Pigeon House station, but the main activity of the staff has been the assembly and part manufacture of switchgear. At the time of my visit the "shops" were full of very well designed and finished cubicles for the new high-powered broadcasting station at Moydrum.

Resistance to Earth of Grid Towers

THE towers for the Thames crossing are 487 ft. high, weigh 300 tons, are 120 ft. square at the base and are 3,060 ft. apart. Each leg of the tower is supported on twelve to fourteen reinforced concrete piles 60 ft. long, and is provided with an earth plate bolted to it and buried in coke. No data exist for the accurate calculation of the resistance to earth for towers of this magnitude.

The earth resistance of a tower depends on the dimensions

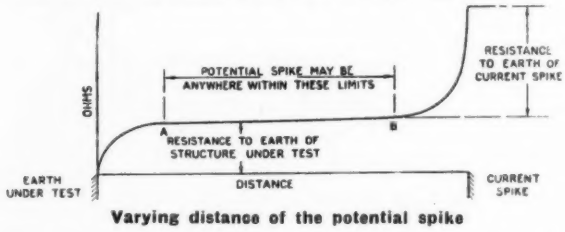


Connections for the earth tests

of its footing and of the earth plates, and on the specific resistance of the surrounding soil. Current through the soil is conducted largely by the moisture present, and the resistance is electrolytic in character; a.c. must therefore be used for measurement. The instrument employed was the "Megger" earth tester, which is made by Messrs. Evershed & Vignoles, Ltd., who carried out the tests. One terminal is connected to the earth under test and the other two to current and potential spikes driven into the soil at suitable distances away. The d.c. from the generator passes through the current coil of the ohmmeter and through a rotating current converter also driven from the generator handle; a.c. is thus passed through the soil from the earth connection under test to the current spike.

Methods of Measurement

The potential coil of the ohmmeter obtains its supply from terminals connected to the earth and the potential spike; this supply is made uni-directional by a rectifier mounted on the same shaft as the current converter. The ohmmeter comprises two coils, mounted at a fixed angle to one another on a common axle, which swing in the field of a permanent magnet;



Varying distance of the potential spike

the axle carries a pointer the final position of which depends on the ratio of the voltage across the earth under test to the current passing through it. The readings in ohms are independent of the generator voltage.

If, after the temporary current spike has been driven into the soil at a sufficient distance from the plate or structure under test, a series of tests is made with the potential spike at varying distances from the plate, the resistance of which is to be measured, the curve obtained will show a rapidly rising portion representing the resistance of the soil surrounding the earth plate, and a rising portion at the other end representing the resistance of the soil surrounding the current spike.

If the potential spike is driven into the soil at a point where the curve is about horizontal, the true value of the resistance to earth will be obtained. To obtain the true resistance to earth of any one tower it is necessary to disconnect the earth wire.

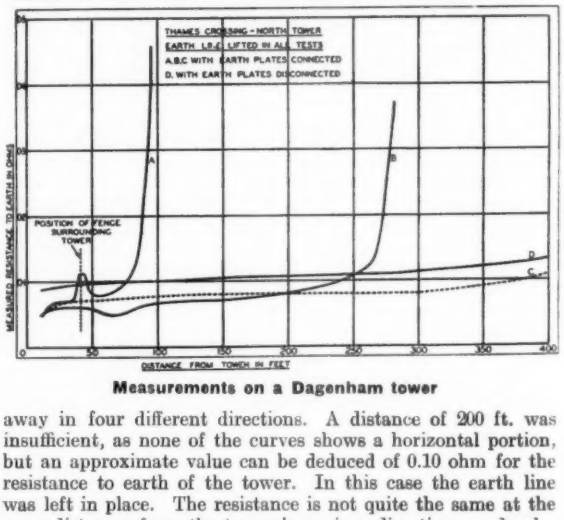
The Dagenham Crossing

Curve A shows that a distance of 100 ft. between the current electrode and the tower is not sufficient, as the curve has no horizontal portion. Curve B, obtained with the current electrode 300 ft. from the tower, is still not quite horizontal in the centre, and still shows signs of the hump due to the position of the fence. At a distance of 600 ft. (C) the curve is probably as horizontal as it would be if the current electrode were placed very much farther out, and shows the resistance of the tower to be 0.08 ohm.

A further test (D) was made after the four earth plates had been unbolted, so that only the earth resistance of the tower structure was measured. The current electrode was placed 600 ft. from the tower. The resistance of the tower structure alone is 0.11 ohm; from the two values obtained of the tower with the earth plates bolted to it and of the tower alone the resistance of the four plates in parallel can be deduced as 0.29 ohm.

Results on Other Towers

The Roding crossing tower is not so high or of such large dimensions as the Thames crossing tower. A series of earth resistance tests was made with the current electrode 200 ft.



Measurements on a Dagenham tower

away in four different directions. A distance of 200 ft. was insufficient, as none of the curves shows a horizontal portion, but an approximate value can be deduced of 0.10 ohm for the resistance to earth of the tower. In this case the earth line was left in place. The resistance is not quite the same at the same distances from the tower in various directions, and polar curves can be constructed to show the variations. The measured resistances in the above cases are extremely low owing to the size of the towers and the nature of the surrounding soil.

Tests were also made on No. 10 tower of the Luton-Watford Line. The curve obtained with the current electrode at a distance of 30 ft. from the tower was not horizontal in the centre, and the resistance increased with the distance from the tower for the whole length of the curve. With the current electrode at 50 ft. from the tower the centre portion of the curve was flat, and at 87 ft. there was a considerable flat portion of the curve in the centre. These curves show the true resistance to earth of the tower to be 4.4 ohms.

Further measurements were made with the earth line in place, and the resistance with the current electrode 100 ft. from the tower was 0.70 ohm.

Acknowledgments are due to the Central Electricity Board for their permission to make the tests and to Callender's Cable & Construction Co., Ltd., the main contractors, for assistance in carrying them out.

Indifference. By W. Arthur Jones, A.M.I.E.E.

Who is to blame, and what is the remedy?

RECENTLY there has appeared in the columns of this journal some correspondence relating to switchboard and sub-station attendants, originating in a complaint of dissatisfaction at the slow progress made in the industry by such employés. It is not proposed to discuss the pros and cons brought out by the various correspondents, as they appear to a large extent—as in the case of many discussions of this kind—to range themselves into two distinct schools of thought. There are the opinions of the younger element, who, with pardonable impetuosity, desire to progress quickly, as against the views of the "old stagers," who appear to be unable to resist the temptation of reminding their younger brethren of the beauty of the present-day circumstances as compared with the conditions which obtained in the days of yore. The natural result of this is that the younger correspondent is not in any way placated by historical references, however pertinent, and one feels a certain measure of sympathy with an objection to considering ancient history as a panacea for present-day problems. At the same time, the lessons of past experience are not to be neglected in the consideration of any problems, and to this extent we also have a measure of sympathy with the "old stagers."

Those who are voicing their complaints may be reminded that there is a financial advantage in present-day rates of remuneration for the positions which they occupy—even allowing for the increased cost of post-war conditions—over the remuneration obtaining for similar positions before the war. The better organisation of the industry, both with respect to employers and employés, and the consequent recognition of the desirability that the rates of remuneration should be adequate are doubtless the main causes.

In addition, however, there is a factor which may possibly be lost sight of, especially in some quarters, namely, that the standard of technical ability required for such positions to-day is much higher than that deemed necessary in the past. Not only is this standard higher in the average, but in many cases the position of a sub-station attendant to-day is one requiring a degree of technical knowledge and ability far greater than that necessary for many a charge engineer in pre-war days. It is probable that this fact has yet to be appreciated by many engineers occupying senior positions in the management of electricity supply undertakings, and it may be that in quite a number of cases the powers that be tend to have a "pre-war" attitude of mind on this question. It will be realised that such an attitude may be one of the primary causes leading to "indifferent employés."

[*Elliott & Fry*

Mr. W. A. Jones is general secretary of the Electrical Power Engineers' Association

What are the Prospects?

The complaint, however, such as it is, resolves itself into one of dissatisfaction with the apparent lack of facilities for advancement in the industry, and this is a complaint which some of us have heard fairly frequently during the last twenty or twenty-five years. It is a complaint of which strong evidence appears to exist, judging by the experience of the average individual. At the same time, it is partly countered by isolated cases of fairly rapid advancement which occur from time to time.

Some of your correspondents make implications which may, or may not, have a measure of justification, but after all is said and done it is evident that so far as advancement in the industry is concerned there is, and has been for a considerable period, a rather definite time-lag once an engineer has reached a certain position, and this would appear to be round about Grade 8 of the National Joint Board Schedule. Especially may this be so with regard to positions on the generation side of the industry. The development of the grid system of the Central Electricity Board, and the consequential closing down of many generating stations—due both to this system and to other operations of the Electricity Supply Acts—must of necessity cause the demand for switchboard attendants to be ever decreasing. In addition, so far as the sub-station attendant is concerned, particularly in respect of possibilities of promotion, he finds that his prospects are affected by the natural necessity of the present holders of higher posts, such as charge engineers, &c., finding some position of employment as a result of displacement due to the shutting down of generating stations.

It will readily be conceded that men of higher technical ability than was considered necessary in the past are to-day required as sub-station attendants. Furthermore, the men with experience who are displaced as a result of the closing down of a generating station will generally fill the position of sub-station attendants or sub-station charge engineers, the ultimate result naturally being to place a bar in the way of the promotion of the younger and less experienced man who has newly come into the sub-station. This is not a new circumstance, but one that has been obvious to those who have watched events in the industry since the Weir Report of 1917 and the passing of the Electricity Supply Act in 1919. It is also a position that may yet become more acute as the schemes of the Central Electricity Board mature.

Is it Their Own Fault?

One cannot help thinking that with all the publicity which has been given to the possible effect of the Electricity Supply Acts—both in the lay and technical Press—and the consequential trend of development in the industry during the past few years the situation which has now arisen and which gives rise to the complaints contained in the correspondence referred to could have been foreseen by those young engineers. Their advisers surely should have had foresight enough to have given advice other than that which would have allowed them to select a branch of the profession that was certain to be a cul-de-sac. On this point also some of the electricity undertakings and the managements thereof have a certain measure of responsibility, as the practice of taking pupils in electricity supply undertakings has not yet ceased. So far as such pupils receive a prior engineering training which is adequate and, in addition, are trained in all departments of the undertaking, and on completion of their training select a career in any department other than that of generation, then little or no criticism can be levelled. When, however, as in many instances, the pupil simply finishes as a switchboard attendant in a generating station and is subsequently given a nominal position at an equally nominal salary, there is little wonder that in a few short years he finds himself in circumstances that cause him to adopt the designation of "Indifferent Employé."

Again, it is a matter for consideration whether some of the responsibility does not rest on the employé himself. We have in the electricity supply industry a National Joint Industrial Council for the operative staff and a National Joint Board for the technical staff, a fairly complete organisation, at any rate so far as the technical side of the industry is concerned. As a result of the work of these two bodies, considerable improvements have been made, both in the remuneration and conditions of employment covered thereby. I am not so sure, however, that the organisation amongst such employés is as efficient as it might be. Many of them are not connected with the various unions and associations which compose the employés' sides of the two bodies, and indifference to this aspect of their professional career may equally be one of the causes of dissatisfaction.

The Displacement Committees

Reference has been made earlier to the question of the men who may be displaced consequent upon the operation of the schemes of the Central Board, and in this connection it may be suggested that a certain amount of indifference, probably not intentional, exists in respect of employés who may be displaced as a result of the operation of these schemes. The National Joint Board of Employers and Members of Staffs (Electricity Supply Industry) has set up a National Displacement Committee and Area Displacement Committees whose function is to endeavour to make provision for the employment of men who may be displaced, but up to the moment these committees have not operated quite as actively as might be desired. Whilst appreciating all the difficulties that may exist, one feels that more results can be obtained than are at present being secured. All parties in the industry, from the Central Board downwards, have it in their power, in a greater or lesser degree, to make a contribution towards a solution of this problem, and one may express the hope that attention having again been called to it the work of the Area Displacement Committees will receive additional and enthusiastic support.

It is not certain that one can characterise as indifference the attitude of certain small undertakings which are distribution

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

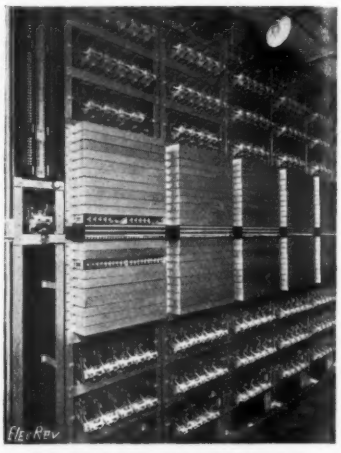
Bypath Telephony

OPENING the discussion at the INSTITUTION OF ELECTICAL ENGINEERS of the paper by Messrs. J. H. E. Baker and E. P. G. Wright on "The Bypath Telephone System" (referred to in our last issue), Mr. G. Hedley said the saving in cost of equipment due to the use of the system would be from £2,000 to £3,000 for an exchange of the average size, while

Messrs. E. P. G. Wright and J. H. E. Baker, of Standard Telephones & Cables, Ltd., the authors of the paper on "The Bypath Automatic Telephone System"

important new facilities could be offered to subscribers. Satisfactory operation and maintenance would depend upon the new switch, but full-scale working at Bethnal Green and Burton-on-Trent would enable useful experience to be gained. Mr. W. H. Grinstead doubted whether the economies claimed in first cost and maintenance had been really achieved. He criticised the system as unnecessarily complicated, and suggested that the use of switches with only 100 outlets would prove costly.

Mr. J. Mason claimed that the step-by-step system gave almost equal facilities without introducing complications or difficulties in alternative routing. Mr. H. J. Gregory advocated a smoother type of drive for the switch than the ratchet and pawl arrangement, which set up vibration. Mr. T. R. Rayner suggested that the system might cause many duplicated calls to be made due to there being insufficient time to find the correct paths; this would entail the introduction of a register, which he regarded as a retrogression.



A typical view of the Advance exchange (London), in which the bypath system is employed

Mr. L. Palmer said that, from personal experience, the modest claims made by the authors with regard to installation had been more than achieved in practice. There was a great advantage in the type of superstructure used, which eliminated the likelihood of damage during construction to the delicate automatic equipment, as all the cabling could be completed before the latter was delivered. The uni-selector switch did not call for such skilled attention as did mechanical switching. Also it was not necessary to test a unit of the bypath system in the shops and then to complete the test on site.

Sir Thomas Purves stated that the General Post Office was making large-scale trials of more than one system and at present he could not say whether this would result in the adoption of one or another of these or of a system that was an adaptation of present methods.

Mr. E. P. G. Wright, in his reply to the discussion, mentioned that the advantages of a larger switch than that with 100 outlets depended on relative costs, and switches with 204 outlets would be used when it was economical to do so.

Carbon-tetrachloride or Porcelain Fuses?

AT last week's meeting of the Overhead Lines Association, Mr. G. H. Dean referred to the need for standardising the spacing of wooden poles forming the limbs of "H" type supports. These spacings, excluding those for the Rutter pole, varied between 1 ft. 6 in. and 6 ft., and this prevented standardisation of switchgear and its steelwork. He suggested the formation of a committee to deal with such standardisation with a view to cheapening gear and improving deliveries. (It was later decided to set up a committee.)

Mr. Dean favoured the rotating type of disconnecting switch (such as was used on the Continent and in the United States) for voltages in excess of 50 kV where more than two insulator units were used per pedestal. The carbon-tetrachloride fuse had to be returned to the makers for renewal, but its average life was five years, whereas the simply rewired open-ended porcelain fuses had the disadvantage of a tendency for the element to fail mechanically.

Nearly 40 per cent. of the cost of material in overhead-line switchgear related to insulators. These should be designed especially for the work, and surfaces coming into contact with the cement should be sand-glazed. The shed thickness of multi-shed units should be proportioned acording to the leakage paths and arcing distances to ensure a potential balance at the cemented joint. All metal caps and pins should be of malleable cast-iron or forged mild steel, jig cemented to the porcelain to secure interchangeability.

Lightning and Birds

In the subsequent discussion the president (Mr. Jocelyn Swan) stressed the need for switchgear to be so constructed as to be easily operated after many months of non-use. He preferred silver-wire to carbon-tetrachloride fuses on the ground of expense; the only fuse renewals in his area had been necessitated by lightning or birds. Compared with three-phase oil switches, the fuse avoided a shut down on all phases. Mr. W. Fennell said that the Mid-Cheshire Co. used a considerable number of rotating switches for 33 kV, for which he found it the most satisfactory type. His experience was that the silver-wire fuse was the most satisfactory for the larger kVA capacities. For 3.3- and 6.6-kV lines he still used the semi-enclosed porcelain fuse, operated by a short stick, owing to its low cost.

Mr. H. C. Fox suggested that insulator caps and pins should be made of gunmetal to avoid corrosion and also because of quicker deliveries direct from the foundry. Major T. Rich referred to the use on the Continent of oil switches with

Indifference (*Concluded from preceding page*)

systems only, and whose conception of the appropriate remuneration for a chief engineer is a salary less than that paid to a switchboard attendant in many undertakings. There have been instances in the columns of the ELECTRICAL REVIEW of advertisements for a chief engineer of an electricity undertaking at a salary of £250 to £300 per annum, and some slightly larger undertakings where the salaries quoted are in the neighbourhood of £400 per annum. Only recently there have occurred two instances of a chief engineer being appointed at a salary considerably less than the figure laid down in the N.J.B. Schedule as the appropriate salary for a deputy chief official in that class of undertaking.

Apropos this subject, the correspondence columns of this journal recently contained a letter criticising certain aspects of one of these cases, and especially the engineers on the short leet who were reputed to be members of either of two electrical associations. One feels that congratulations should be extended to your correspondent in having such complete information, both with respect to the engineers who were on the short leet and their membership of electrical associations, but so far as my Association is concerned we have only had one such case of recent years, when the member concerned was expelled; and with regard to another electrical association, it is known that three of its members who were on the same short leet were requested to resign their membership. It will thus be seen that some associations at any rate are not waiting until salaries fall to zero, although it is probable that some of your correspondents may be so doing before being themselves willing to incur the expenditure of either time or money in support of these associations.

mechanical reclosing arrangements operated by weights and thought the principle applied to air-break switches might have a future.

Mr. P. W. Laverick, who replied partly on behalf of the author, said that the renewable fuse was satisfactory up to 10,000 or 15,000 kVA. Tests had shown that the switch with the rocking insulator would break greater currents than the rotating type. Bird troubles, in his experience, became fewer after a line had been erected for some time. For economy the air-break switch had an advantage over the oil switch. The practice of his firm was to use nickel-plated gunmetal for pivots, and he had never found trouble with a non-rusting pivot. There were now available two designs of disconnecting switches which were proof against ice loading and would not freeze up.

Electrical Measurement

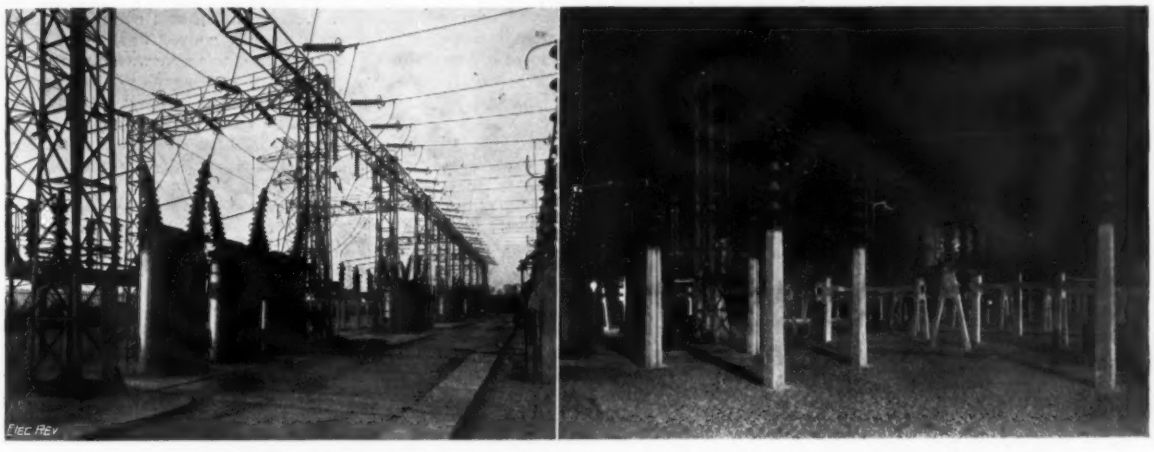
A PAPER on electrical measuring instruments of the magnetic type was read last week before the ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS by Mr. F. C. Knowles, in which he states that many intricate instrument parts to-day are stamped instead of being cast, as they were a few years ago, with subsequent machining. Ebonite is being largely displaced as an insulation by synthetic resin owing to the ease of moulding and high finish obtainable. Mica is used under compression where mechanical strength is required—the only natural product used without treatment.

Most low-resistance conductors have a high temperature coefficient of resistance, that for copper being 0.4 per cent. per deg. C. Alloys of copper and nickel are available with a resistance thirty times that of copper and a negligible change of resistance with temperature. Thus the use of a suitably proportioned constantan shunt with a moving-iron voltmeter would enable the increased resistance of the instrument to be kept within 1.8 per cent. instead of the 20 per cent. variation which would have been obtained had copper only been used.

The iron for electro-magnets must have a high permeability and a low coercive force and, for a.c., low hysteresis and eddy-current losses. Silicon irons, *e.g.*, Stalloy and Lohys, were used for many years, but the more recent Mumetal requires only one-fifth of the magnetising force to produce the same induction density; the low hysteresis loss enables moving-iron instruments to be as accurate as moving-coil instruments for a.c. or d.c. For permanent magnets, the hardened steel has tungsten, chromium, or cobalt as a constituent. Cobalt to the extent of 35 per cent. has been used during the past ten years; this has not increased the remanence per sq. cm., but has trebled the coercive force, thus enabling smaller magnets to be obtained giving the same energy. The moving-coil instrument is the most accurate for d.c. measurements, and with the dry plate rectifier can be used for a.c. work also. It is also the basis of the true ohmmeter.

The cheapness and simplicity of the moving-iron instrument has recommended its use for general current measurements, and the introduction of inexpensive a.c. designs has increased its scope. Most a.c. ammeters above 100 A have current transformers with 5-A secondaries, and voltmeters above 600 V have potential transformers with 100-V secondaries. A special application of the moving-iron principle has been developed for power-factor measurement. Dynamometer instruments, which rely on the interaction of two coils, are used almost entirely for a.c. circuits, principally for wattmeters and power factor and frequency meters. For ammeters and voltmeters they have been displaced by moving-iron instruments, in view of the high cost of the dynamometer and the operation of the square law which gives a scale very close at the bottom and extremely open at the top.

Induction instruments for a.c. circuits are used considerably as wattmeters, ammeters, and voltmeters. They have an angle of movement of about 300 deg. and have no electrical connections to the moving system. The dials can be made as small as 2½ in. A frequency indicator of the induction type has recently been introduced working on the differential wattmeter principle; the torques of the discs are balanced at the correct frequency.



The Barton, Manchester, grid sub-station by day and by night **(See note on page 138)**

The Soil and Radio Reception

MOST broadcast listeners are familiar with the function which the earth connection plays in radio reception. Unless the receiver is of the portable type, it is essential that the earth connection should have a low electrical resistance. The earth plays another and more important part, however, in wireless communication, particularly in the distribution of broadcasting programmes, for at moderate distances up to fifty or one hundred miles, the waves from the transmitting station travel along the earth's surface, and some of their energy is lost in setting up currents which have to overcome the resistance of the earth. If the earth is a good conductor, this energy loss is reduced to the minimum, and thus the field strength of the waves is maintained to considerable distances, and good reception results. If the ground is poorly conducting, the waves lose their energy rapidly and indifferent reception is obtained. It is because the sea is a good conductor that signals received over an all-sea path are much stronger than those received under similar conditions overland.

In a paper read before the ROYAL SOCIETY on January 19th Dr. R. L. Smith-Rose, of the National Physical Laboratory, Teddington, described some investigations on the electrical properties of soil, which have been carried out at the Laboratory on behalf of the Radio Research Board. The experiments consisted in measuring the electrical resistance of samples of soil from different sites under conditions corresponding with those met with in radio communication. The results of the experiments showed that while dry soil is a poor conductor, the conducting power is increased more than a thousand times when water is added to bring its moisture content up to the value commonly met with in garden soil. Soil taken from different sites was also studied, and its properties varied to a considerable extent. A knowledge of these properties is important in connection with the location of wireless transmitting stations.

Electric Furnaces for Steel Making

THAT there was danger as well as real value in the tendency to specialisation in societies was pointed out by Professor F. C. Lea (Dean of the Faculty of Engineering, Sheffield University) in his presidential address to the SHEFFIELD SOCIETY OF ENGINEERS AND METALLURGISTS at Sheffield recently. The artificial barriers made by names could not be maintained, and automobile, electrical, mechanical, and structural engineers could only progress by taking advantage of the aids that new discoveries in science could give; in perfecting designs of parts and wholes to perform their purposes more effectively; to use materials to greater advantage, and to employ all metallurgical aids in obtaining suitable metals for parts of the

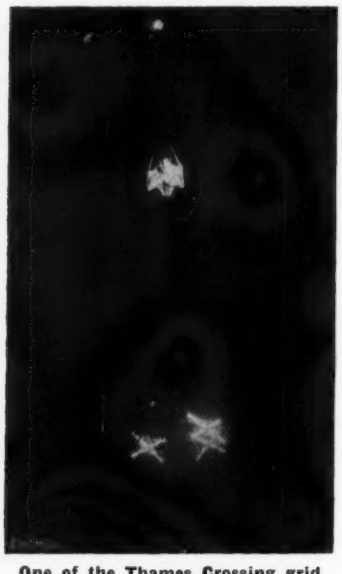
design, and for suitable tools for the fabrication of the elements of the design.

While metallurgical progress had made possible great changes in engineering practice, developments in engineering had had a corresponding effect on metallurgy. It made possible larger units, and mechanically or automatically controlled operations. Electric furnaces had been a great factor in metallurgical development, particularly in connection with aluminium and alloy steels. The induction furnace was first built by Kjellin in 1900, but only during the last ten years had it made any considerable headway. About 1910 only 52,000 tons of steel was produced in electric furnaces; in 1925 the amount was over one million tons. In 1929, out of an aggregate world production of 120,000,000 tons, steel produced in electric furnaces would probably be about two million tons.

As better tools would be demanded by engineers and alloys to meet the needs of power production, the production of alloy steels would become more and more essential, and, therefore, electric furnaces were likely to be of growing future importance. That raised the important problem at what price the engineer could supply the metallurgists with electric power. At the present time there seemed little hope of increasing the efficiency of steam plant to any appreciable degree. Water power was the other source of producing electricity on a large scale, which engineers could exploit without severe demands on metallurgists, although there were still steel problems to be faced in dealing with high velocities of water, &c.

How to Sell a Cooker

THE January meeting of the 1932-33 series arranged by the BRITISH ELECTRICAL DEVELOPMENT ASSOCIATION was held at Caxton Hall, Westminster, on January 20th, and might be described as being perhaps more of an entertainment than a conference. The stage was held throughout the evening by Mr. Wallace Attwood, who demonstrated the selling of an electric cooker, first by the manufacturer's salesman to the supply engineer, and secondly, by the showroom salesman to the consumer. Mr. C. D. Taite (chief engineer to the Lancashire Power Co.) presided. In the course of his opening remarks he said that those in the provinces hoped to be able to hold regular salesmanship meetings at a very early date, and so emulate London's example.



One of the Thames Crossing grid towers by night

Mr. Attwood first discussed the lines on which he proposed to pursue his demonstration, and referred a good deal also to the theory of selling. In the course of his remarks he said he had had the opportunity of watching the methods of a particular salesman who was very successful, and who sometimes carried as much as 50 per cent. of his firm's sales. The secret of his success was that he created a " buying " atmosphere, *i.e.*, he was able to make his " prospects " feel that they were buying rather than that he was selling to them; the distinction was important. Discussing the sale of an article to a retailer, he urged upon salesmen that they must make it clear to the retailer to whom they were trying to sell that they had done some thinking on his behalf. In the sale of a cooker to a consumer in the showroom, one must demonstrate it and relate it to the amenities and economics of her home, and make her experience a sense of loss by not possessing it.

Dealing with the Supply Engineer

Then we came to the demonstration, and Mr. P. P. Wheelright mounted the platform to take the part of the supply engineer to whom Mr. Attwood was to sell the cooker. In view of the difficulty often experienced in even obtaining an interview with a business man, the assistance was obtained of Mr. Watson, a member of the Corps of Commissionaires, and Mr. Attwood had to approach him first. This part of the programme did serve to show very effectively the importance of the right approach. Mr. Attwood emphasised the importance of making the commissionaire feel that the caller was going to render a service to the company whose representatives he was calling upon. Mr. Watson said that a commissionaire with any intellect at all could usually convey to his employer a description of the manner of the caller and whether he was worthy of an interview.

Eventually Mr. Attwood was admitted to the presence of Mr. Wheelwright, having sent a message through the commissionaire to the effect that he wished to discuss a matter relating to two-part tariffs. He then proceeded to discuss the beneficial effects of the increased use of domestic power-consuming apparatus upon the load factor and directed the conversation ultimately to cookers. He then produced a catalogue of the cookers produced by his firm, together with testimonials, &c., stressing the point of view of the user throughout; prices were quoted, and the interview resulted in Mr. Wheelwright agreeing to take a cooker for test purposes, and Mr. Attwood obtained permission to call monthly in order to see how the cooker was meeting the tests.

Interesting a Consumer

The final part of the programme was that of interesting a consumer in a cooker displayed in the showroom. The consumer in this case was Miss Gordon, who entered the showroom with the object of paying her account. Mr. Attwood, as the salesman, said that in these circumstances it was a help to a salesman to know whether or not the consumer concerned was a power consumer, and he suggested, therefore, that the accounts rendered to power consumers might be printed on red or some other distinctively coloured paper, so that a salesman in the showroom would have some foreknowledge of the type of consumer with whom he was dealing.

Mr. Attwood first engaged Miss Gordon in conversation by directing attention to a notice displayed in the showroom, giving the costs of cooking certain meals for a given number of persons by means of an electric cooker, and subsequently demonstrated the simplicity of the cooker itself. He emphasised the certainty of the results obtained, and the fact that the food could be left in the oven to cook without needing attention from time to time, and again quoted figures to illustrate the low cost at which certain items of food could be prepared. The fact was also emphasised that the current could be switched off before the cooking was completed, the remainder of the cooking being effected by the residual heat in the oven.

Lighting Buildings for the Wealthy

DR. J. W. T. WALSH had to stand the fire of the Irish Centre of the INSTITUTION OF ELECTRICAL ENGINEERS on January 19th unaided by his co-author, for Mr. A. B. Read was not well enough to make the journey. The large audience, whilst regretting their deprivation of Mr. Read's personality, were well satisfied with his collaborator's disquisition upon a subject which is growing more important as research and invention become more prolific, and fully showed their appreciation of the paper.

Several speakers expressed surprise and disappointment at the total absence of architects at the delivery of a paper of which at least half must have had a very special appeal to them. An invitation, accompanied by a copy of the paper, was sent to every architect in Dublin, and even if any of them read the paper at home they were not likely to appreciate its value because, as Mr. Tatlow said when proposing a vote of thanks, the lantern slides were needed for the best interpretation of many parts. Certainly the slides were remarkably striking, although they induced two speakers to grumble that the point of view taken by the authors was narrow as they dealt solely with the elaborate and costly installations by individuals and public companies with money to burn, to the utter exclusion of the application of modern methods of illumination to the homes of the people. One of these critics admitted he had not read the paper, and it was clear to all who had read it that the other was in like case. for the discussion as a whole did the breadth of the paper justice, and probably satisfied Dr. Walsh that his long journey had not been made in vain.

Mr. Tatlow agreed that wholly indirect lighting was a dismal affair, and said that the first time he employed it was for lighting a morgue. Dr. Walsh, in replying to the discussion stated that British opal glass-ware was now at least equal to, and was probably better than, the opal glass made in any other country, as a direct result of intelligent co-operation among research workers, glass makers, and fitting designers. Certain makers now produced opal glass having an efficiency of 80 per cent.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Inadequate Mains: Indifferent Employés

The letter from "An Indifferent Employé" in this week's issue contains a statement concerning electric heating which should not be allowed to pass unchallenged.

It is difficult to understand exactly what he means by "breathing burnt air from an electric radiator." In any indoor atmosphere there will be found floating small particles of dust and other foreign bodies carrying microbes of varying degrees of virulence. When an electric fire is used so that none of the convected heat escapes directly up the flue it has actually a sterilising effect on the air of the room. The hot air rising from an electric fire, to which "Indifferent Employé" objects, is therefore far cleaner and purer than the rest of the air in the room, and the circulating effect it sets up is in itself very desirable. The same effect could not be obtained by a flueless gas-heater on account of the products of combustion which by no means consist entirely of harmless carbon dioxide.

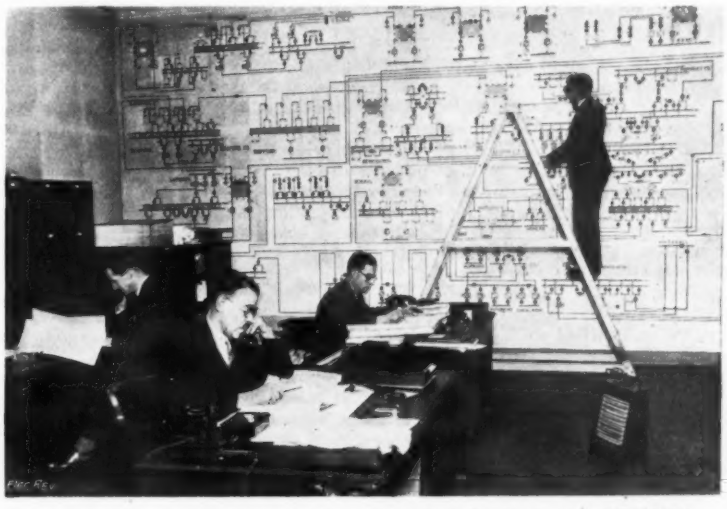
The convected heat from an electric fire should never be allowed to escape up the flue, since this is quite unnecessary and increases the cost of electric heating by more than 50 per cent. Of course adequate ventilation is of the utmost importance, and the flue undoubtedly aids this. However, the design of some fire-places, and also of some electric fires, makes it very difficult to prevent direct loss of the convected heat. In this case it will be necessary to close the flue, and the problem of providing alternative ventilation must not be overlooked.

This is a question to which the electrical industry could with advantage devote much more attention, as undoubtedly many cases of dissatisfaction with electric heating are due to the direct loss of convected heat up the chimney. It should not be difficult to find a remedy. W. B. PARKER.

Monkseaton, *January 21st.*

Does "Indifferent Employé" know that the Lord provides food for the sparrows but he doesn't stuff it into their mouths; those sparrows which are indifferent to that simple fact will surely die. I am wondering if "Indifferent Employé" is paralysed and unable to get about and seek to improve his position.

Regarding his views on "discounts and profits," price-cutting in the electrical and wireless industries has reached such a point in London that it has become possible for the public to get goods at wholesale prices at any of the so-called "cut-price" shops. The skilled employés at these shops are lucky if they get £2 a week, and many of them hold degrees in engineering. Their employers say they cannot pay more wages because they sell their goods at "cut prices." The customers of these shops even expect full "servicing" of the goods which they have bought to be done at a "cut price." Surely "indifferent employés" are created by such business methods and they certainly cannot be blamed.



The temporary control room for the South-East England grid at Bankside, London, S.E. The permanent building nearby is in course of erection

Power stations are only one end of the industry, and we at the installation end are not asking the producers to sell current at cost price. STUDIO ENGINEER.

January 21st.

I feel compelled to dissuade "An Indifferent Emp'oyé" from his present mood. I have passed through the same phase to my cost, and I would save him from his rashness and protect the industry from the untold harm which may result from similar outbursts.

I would advise him to look at life from a different angle, and he may soon find that his "boss" has yet a smile for him, although apparently caught in this relentless mechanised age. O. A. JONES-EVANS.

N. Wales, *January 21st.*

Power Stations and Horticulture

The report in your issue of January 20th of Dr. Fleck's paper in which he refers to the possibility of growing tropical plants and fruits in greenhouses adjacent to power stations utilising waste heat or heat generated in these stations has induced me to send you the following information, in case it has not reached some of your readers who may be interested.

In Germany, horticultural work has been carried out on these lines, and at Klingenberg there are approximately 2½ acres of hothouses in which cucumbers and tomatoes are

Two views of the new Brighton showrooms described on page 130 of this issue

grown, and in addition some flowers. These houses are heated by means of steam bled from the turbines, which is passed through coils at 35 lb. per sq. in. to heat the circulating water of the greenhouse heating system. To maintain the correct temperature in the cucumber and tomato houses with a minimum outside temperature of minus 4 deg. F. approximately six tons of steam per hour is necessary. Considerable "off peak" load is obtainable by using electric soil heating, which is mainly required during the night. F. E. ROWLAND.

London, W.C.2, *January 23rd.*

The Cost of Neon Signs

We have recently inspected several neon outdoor signs, but are at a loss to understand the high prices charged for them. There may be some good reason for this of which we are unaware, and we should be very glad to receive the views of your readers on the subject, having regard to the great interest of gaseous discharge lamps at the present time.

THE DEVON ELECTRIC & GENERAL SERVICES, LTD.
G. V. Underwood, *General Manager and Engineer.*

Staverton, Totnes, *January 17th.*

A Tale of an Ohm

I recently wrote to one of the largest electrical concerns in Great Britain asking them to send me one ohm of any insulated resistance wire to carry 10 A. In reply came this gem: "We regret that we are unable to do this unless you can tell us what length of wire you are proposing to use to get your ohm. . . . Upon receipt of this information we will do our utmost to satisfy your requirements." And yet some of our young men don't get on in the profession. OHMLESS.

January 17th.

Lead-covered Cables at Sea

Practical suggestions by sea-going electricians are welcomed by the technician and are often useful. Mr. M. S. Bagnall's letter in your issue of January 13th, however, indicates such a limited knowledge of the facts as to call for comment.

As against his whole-hearted denunciation of the use of lead-covered cables, it is perhaps well to remember that this type of cable has been approved by the Admiralty and the principal classification authorities after prolonged expert research, coupled with many years' experience in every type of vessel. One important point of which Mr. Bagnall appears to be unaware is that the use of a pure lead sheathing, such as was general until three or four years ago, has now been abandoned by the principal manufacturers of marine cables in favour of an alloy. It is admitted that the older type of pure lead sheathing was liable to crystallisation and fracture under vibration, thus leading to breakdowns. The present alloy sheathing, however, has eliminated this trouble while retaining all of the advantages of a lead sheathing, the chief of which, of course, is its water-tightness.

After twenty-five years' experience in the design of electrical installations in all types of vessels, the writer considers that lead-alloy sheathed conductors, properly installed and with the sheathing bonded and earthed to the ship's structure and ends sealed, make the safest and most durable job. Mr. Bagnall asserts that lead-covered cable is popular on account of cost, but the writer would assure him that, installed as described, it is anything but a cheap proposition. As for the "fireproof unbreakable cables" mentioned in his letter, one would be glad to have particulars of these, and Mr. Bagnall may be assured that such a product (if it exists) has a great future in marine work. Most cable makers, however, would hesitate to guarantee such qualities to any of their cables and content themselves with the appellation "fire-resisting."

As for the use of "armoured and asbestos-braided cable," which was apparently installed in the machinery spaces of Mr. Bagnall's ship, one can only surmise that the vessel in question was operating on a low voltage, say, 110, instead of the more usual voltage on large vessels of 220, also that the ship was not classed with either of the British classification authorities, who distinctly call for lead-covered conductors in these spaces. It is difficult to see how such a cable could have been, in any sense, water-tight, unless, of course, there was a lead sheathing under the armour. At all events, the writer would hesitate to specify it at 220 V any more than the suggested c.t.s. asbestos-braided and rubber-insulated conductors which Mr. Bagnall advocates for passenger accommodation. It is not stated whether the latter type of conductor would be clipped up on the surface or laid in casings. The well-known hygroscopic quality of asbestos coupled with the deleterious action of light, particularly sunlight, on the rubber are points which are not in its favour.

To sum up, there is nothing wrong with high-grade C.M.A. lead-alloy covered wire as now manufactured with a percentage of antimony, but it must be properly installed. That is to say, suitable runs should be chosen, the sheathing should be bonded at all fittings, junctions, switches, &c., and securely earthed to the ship's structure and all ends sealed. If this was thoroughly carried out we should hear less of fires on shipboard being due to electrical causes. L. H. GOUGH.

London, E.C.3, *January 17th.*

Tough-rubber sheathed cables with an overall braiding which is weatherproof and does not support combustion have been extensively used for distributor cables in liners commissioned in recent years. Rubber-sheathed cables manufactured specially to meet conditions on board ship are also extensively used in passenger accommodation. Lead-alloy sheathed cables with a rubber dielectric made to a reliable specification, with or without weatherproof and fire-resisting braiding, are, and will continue to be, extensively used on account of their reliability, accessibility, and visibility. With lead-covered, armoured, and braided cables for engine and boiler rooms, &c., and the type of cable installed on the *Empress of Britain* for switchboard and dynamo mains we now have a complete range of cables suitable for any vessel.

Whatever the cause of recent disastrous fires on vessels of other nations may have been, it is safe to say that the quality of cables and workmanship incorporated in electrical installations in vessels of our Mercantile Marine, even in those that have been in commission for a number of years, makes it certain that fires due to faults in cables are few and far between. W. S. WILSON.

Long Benton, Northumberland, *January 21st.*

Mr. Beara asks why rubber-sheathed cable should not be used for wiring passenger accommodation in ships. Each type of cable has its advantages and disadvantages; unfortunately no one type can be considered perfect.

If rubber-sheathed cable catches fire it may not only burn freely but "feed the flames"; no reason need be given for the initial conflagration. Rubber expands to oil, smells, becomes soft and has little mechanical strength; electric currents, oil-saturated rubber and poor insulation do not appear to be a very desirable combination. FIGS.

January 20th.

The Zero-shunt Circuit

In the ELECTRICAL REVIEW of January 13th I notice an interesting article by Mr. G. G. Blake, wherein he describes observations with a condenser radiometer. May I direct his attention to three points?

He speaks of the "Blake zero-shunt" circuit. The actual circuit referred to was shown in a paper of mine in the proceedings of the Royal Dublin Society, February, 1921 (XVI, No. 17). The term "zero shunt" was applied to such a device for the first time by me in a letter to *Nature* (June 2nd, 1923) in reference to my recording ultramicrometer (U.K. Patent 179254/21). Figure 3 in Mr. Blake's article is actually this ultromicrometer circuit, which has been fully described in the *Philosophical Magazine*, Vol. XLVI, p. 81, July, 1923; in *Engineering*, September 8th, 1921; in the *Scientific American*, February, 1922; and elsewhere many times since.

Dublin, *January 21st.* JOHN J. DOWLING.

With reference to Mr. J. J. Dowling's letter *re* his zero-shunt circuit, if he will refer to my "History of Radio-Telegraphy and Telephony" (Chapman & Hall), page 324, he will find that I give him full credit and references to his papers on his most useful circuit. I believe the name "zero-shunt" had its origin in him. The circuit shown in my article "A Radiometric Condenser" in the ELECTRICAL REVIEW of January 13th is a development of his circuit which I made several years ago for recording radio-telegraphic signals. This also is described with a diagram in my book.

An examination of our respective circuits discloses the fact that whereas in his original circuit he employs a separate battery to oppose the e.m.f. applied to the galvanometer, I have done away with it and in its place employed a potentiometer across the l.t. filament battery. This not only facilitates very fine variation of voltage, but also adds to the stability of the circuit.

I regret that you did not publish the reference list which I submitted to you with my article, from which the origin of my circuit could have been traced. G. G. BLAKE.

Richmond, Surrey, *January 25th.*

The Institute of Metals

The Institute of Metals, which this year celebrates the twenty-fifth anniversary of its foundation, is holding its annual meeting in London on March 8th and 9th. The annual dinner will be held on March 8th, when the president, Sir Henry Fowler, will be in the chair.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

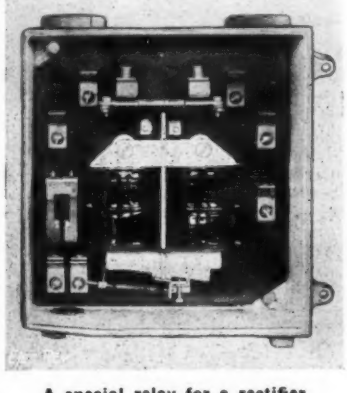
A Combined Hair Dryer and Mirror

The Stewart "500" hair dryer reflected in a looking glass showing front and back

Generally speaking, the introduction of a new hair-dryer means nothing more than a different shape or loading, but THE COOPER-STEWART ENGINEERING CO., LTD., has avoided this by introducing a hair-dryer and mirror combined; in fact, so far as we are aware, it is the first British firm to market such an article. The model illustrated is "No. 500," giving hot air only and priced at 32s. 6d., but for another half a crown it can be obtained with a switch for providing hot or cold air. The operating switch can be manipulated by the hand holding the dryer and the fluted handle and air nozzle are both detachable for packing. It can be obtained from the makers at 136, Long Acre, W.C.

A Rectifier Valve Relay

A relay recently produced by MESSRS. J. G. STATTER & CO., 16, Great George Street, S.W.1, exemplifies the unusual types of specialist equipment which switchgear manufacturers are sometimes called on to produce. Its duty is to close the d.c. rectified-current circuit forty seconds after the filament is switched on. The apparatus consists of d.c. contactors at the top of a panel which are closed when the armature lifts. When used with a Philips valve "No. 1768," the relay is wound for operation at 1.8-V, 50-cycle a.c., and is connected in parallel with the filament. The current taken by the relay is about 0.2 A.



A special relay for a rectifier valve

Switching on is effected by a thermostatic bi-metal strip which carries the filament current of 11 A, and is connected in series with it when forty seconds has elapsed. The bi-metal strip closes a s.p. auxiliary switch which completes the relay circuit which, in turn, operates and closes the d.c. switch. The gear is housed in a cast-iron case measuring 7⅞ in. by 8¼ in. by 4 in. deep.

New R.I. Transformer and Choke

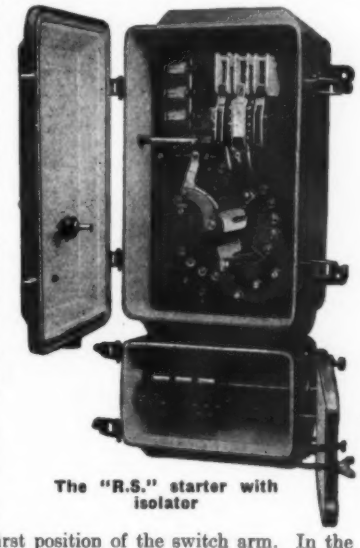
A new input transformer and output matching choke are now made by RADIO INSTRUMENTS, LTD., Purley Way, Croydon, for use in "quiescent" push-pull low-frequency amplifying circuits. The transformer has two primary and three secondary terminals, being suitable for direct or parallel feed. When directly fed the anode current may be as high as 3 mA. The high total ratio of 1 to 8 allows for a large grid swing at all frequencies, and the sectionalised low-capacity windings are carefully matched. The high primary inductance of 30 H (when no d.c. is flowing) given by the nickel-iron core ensures good bass response, while an internal screen, which can be earthed, averts interaction with other components. The d.c. primary and secondary resistances are 900 and 9,500 ohms, respectively, and the price is 15s. (royalty 1s. 6d. extra). The corresponding output choke (price 12s. 6d.) has very carefully matched and balanced windings, the low resistance of which prevents peak distortion. The liberal core section gives high primary inductance. Seven terminals are provided so that four ratios are available for matching most types of loud speaker to the optimum plate-to-plate impedance for operating triodes or pentodes in "quiescent" push-pull circuits.

A new R.I. transformer

This new circuit has been devised by the B.T.-H. Co. as a means of l.f. amplification in battery-operated receivers, and is capable of a much larger output than usual (up to, say, 1.5 watts for moving-coil speaker operation) without increasing the anode current. The two output valves are connected in push-pull and biased down to the bottom bend of their characteristic curve, so that each operates on alternate half cycles only. The circuit is said to be "quiescent" because the anode current is very small with no modulated input.

A Combined Stator and Rotor Starter

The "R.S." hand-operated stator/rotor starter is a new development by MESSRS. E. N. BRAY, LTD., Whipps Cross Works, Wood Street, Walthamstow, E.17. It controls three phases on three-wire circuits and the two outers on two-phase four-wire circuits. The control of the stator is a three- or two-pole magnetically operated contactor which is automatically closed by the forward movement of the starter handle from the "off" position. The rotor is controlled by a three-phase switch mounted on a "Sindanyo" base with six or eight contacts per phase, the switch arm being held in the "full-on" position by a trigger against the spring. The motor can then be stopped by releasing the trigger.



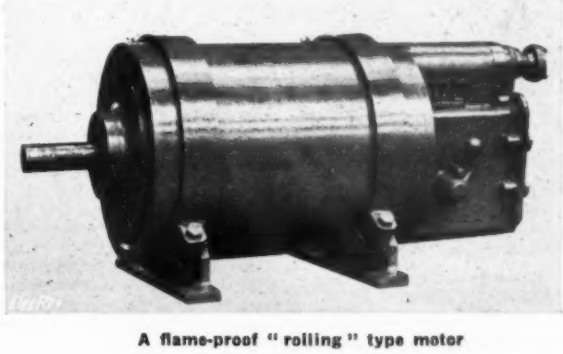
The "R.S." starter with isolator

A pilot switch operated by a cam on the switch arm ensures starting in correct sequence, and the stator contactor can only be closed in the first position of the switch arm. In the event of the contactor opening due to failure of supply or overload, it is necessary to return the starting handle to the "off" position before a restart can be made. The rotor circuit is never broken. The contactor forms the no-volt release, and an adjustable thermal overload release is employed and can be reset by pressing a knob on the outside of the case. The stator contactor contacts and the rotor self-aligning and reversible contacts are of copper and are renewable. The resistances consist of "Eureka" wire wound on threaded porcelain spools which are readily accessible as the complete interior of the starter can be hinged out for inspection.

Prices range from £14 for the 5-h.p. model to £23 for the 30-h.p. model with no-volt release and two overload releases. With three overload releases the price is 8s. more. Isolators can be obtained for £5 for models up to 15 h.p. or £6 8s. for sizes between 17½ and 30 h.p.

Flame-proof Motors and Switches

For meeting the latest requirements and suggestions of the Ministry of Mines regarding flame-proof enclosures for electrical machines, MESSRS. LAURENCE, SCOTT & ELECTROMOTORS, LTD., Gothic Works, Norwich, have introduced a new range of a.c. and d.c. motors and starters, which are also suitable for industries in which inflammable gases may be encountered. Motors for driving conveyors, pumps, and semi-portable machinery from 2 to 30 h.p. are of the welded-steel cylindrical



A flame-proof "rolling" type motor

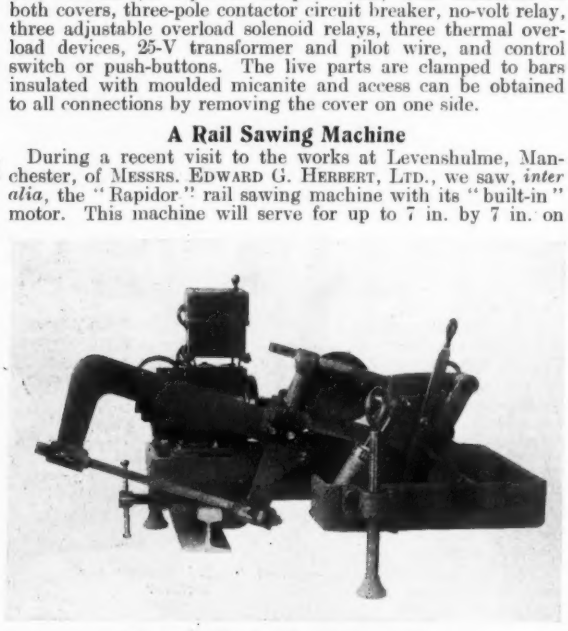
rolling pattern. The barrels and fixings are machined on the outside to standard dimensions so that any motors of the same frame size can be rolled into position with the correct alignment. Squirrel-cage rotors can be provided with a built-on flame-proof direct starter (as illustrated) fitted with three thermal overloads, no-volt coil, and pilot contacts for gate-end switch control. The rotor and its cartridge bearings can be removed by unscrewing a dozen bolts.

Motors above 30 h.p. are cooled by seamless oval steel tubes welded to the circumference of the stator. Internal and external fans circulate air through and over the tubes; the cooling units and external fan are surrounded by an outer boiler-plate casing.

An electrically fabricated gate-end switch with a steel boiler-plate case designed to withstand explosion pressure without vent relief is another new development. Two sizes are available (1) with 100-A B.S.S. plug and circuit breaker, and (2) with 30-A "Crofton" Buxton-tested plug and 50-A circuit breaker. The internal apparatus includes a three-pole change-over isolator (in separate compartments) with interlocks to both covers, three-pole contactor circuit breaker, no-volt relay, three adjustable overload solenoid relays, three thermal overload devices, 25-V transformer and pilot wire, and control switch or push-buttons. The live parts are clamped to bars insulated with moulded micanite and access can be obtained to all connections by removing the cover on one side.

A Rail Sawing Machine

During a recent visit to the works at Levenshulme, Manchester, of MESSRS. EDWARD G. HERBERT, LTD., we saw, *inter alia*, the "Rapidor" rail sawing machine with its "built-in" motor. This machine will serve for up to 7 in. by 7 in. on

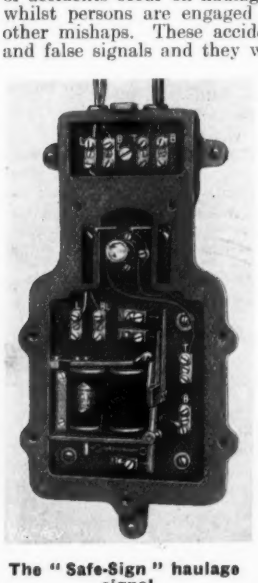


The "Rapidor" rail sawing machine

the track, and is driven through worm reducing gear. The motor is carried on the cradle and is surmounted by its switch, and the whole is entirely self-contained and portable. It rests on four feet, adjustable in height, and its vice grips the rail by the bulb. The saw lifts on the return stroke. The machine weighs 600 lb., measures 48 in. by 33 in. (floor space), and is equipped with a 1-h.p. motor.

A Visual Haulage Signal

The reports of Inspectors of Mines show that a large number of accidents occur on haulages due to the starting of the rope whilst persons are engaged in dealing with derailments and other mishaps. These accidents are directly due to confused and false signals and they would probably have been avoided if some method of danger indication other than the continuous ringing of the bell had been provided. It is claimed that the "Safe-Sign" provides a solution to this problem in a simple and economical manner as no alterations are required to existing signalling circuits other than a slight rearrangement of connections between the bell, battery and signal, and, as there is nothing in the signal to wear or deteriorate other than the lamp, no attention should be required after installation (except the replacement of the lamp). The signal is mounted in a convenient position near to and preferably in front of the engineman. In working, all the usual signals are received and worked to in the ordinary way and the danger signal is given by the crossing or slipping together of the wires at the point of obstruction which gives a continuous ring on the bell. To stop this continuous ring the engineman presses a lever on the apparatus whereby the ringing is stopped by the disconnection of the bell from the circuit and a red danger sign is illuminated. Any attempts to transmit signals from any point are then rendered ineffective as the wires are already crossed. The danger sign will remain visible until the wires are separated throughout their length and immediately this is done the danger sign is removed and signals can be transmitted without any further attention by the engineman. By this automatic and instantaneous resetting no time is lost after the road is cleared, as the information is at once conveyed to the engineman. The latest model gives a flashing or non-flashing signal by a small adjustment. A special bracket for mounting the signal so that it can be swung through an arc of 180 deg. has been introduced; this is to enable it to be visible to the engineman in any part of the enginehouse, the man turning it towards whichever end of the house he may be working in. The signal is manufactured by THE ELECTRIC POWER PLANT CO., Highurst Street, Nottingham.



The "Safe-Sign" haulage signal

Spraying Equipment

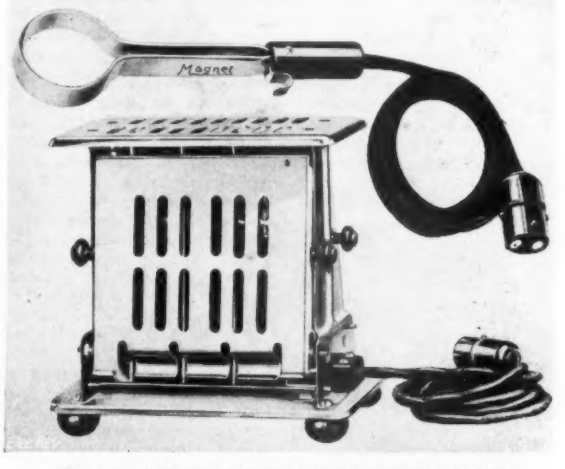
The lacquering, gilding and bronzing of mass-produced articles is being done more and more by spraying instead of by brushing. MESSRS. W. CANNING & CO., LTD., 133-137, Great Hampton Street, Birmingham, have recently added three new items to their range of equipment. One is a twin-cylinder air-cooled air compressor for pressures between 30 and 50 lb. per sq. in., which will operate up to three pistons working at 30 lb. per sq. in. or one piston working at above that figure. "Caloriter Snowlac" requires a No. 3 nozzle and a pressure of 40 lb., but all other lacquers can be sprayed at 30 lb. with a No. 2 nozzle.

The Canning air compressor and container

In addition to the usual piston rings a scraper ring is fitted which, in conjunction with the fine grinding on the piston and cylinders, minimises the risk of oil passing to the cylinder head and pipe line. Lubrication is by the controlled splash system, and a heavy flywheel is fitted to give smooth running. The new unloading device which can now be supplied as an extra operates on the valves of the compressor and can be set to function at a predetermined pressure.

Two "Magnet" Domestic Appliances

A short time ago the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, added to its already extensive range of domestic apparatus a new immersion heater (D.5350) and a toaster (D.5603). The latter, which is nickel plated and of the reversible type, is cheaper than the company's older model as



The new "Magnet" toaster and immersion heater

it is priced at 17s. 6d. The loading is the same, *i.e.*, 600 W, and the feet are heat insulated. The immersion heater is available at 9s. 6d. (300-W model) and 12s. 6d. (500 W), and is of conventional shape, finished in chromium plate with a "Bakelite" handle. The small model is designed to boil half a pint of water in seven minutes and the larger model one pint in the same time.

The Exchange Problem in Europe. By A. J. S.

An alternative to barter

THE most serious obstacle at present confronting the exporting manufacturer is the fact that the present system of exchanges in Europe has ceased to function to a great extent by reason of the severe restrictions upon foreign payments that have been imposed by all the different countries that are at present holding precariously to the gold standard. It may be true that for legitimate trading purposes it is still possible to procure foreign exchange to a certain extent even under the most stringent regulations, but in practice these restrictions are sufficiently onerous to discourage all but the most vital trading transactions.

A return to primitive barter transactions, which has been seriously recommended in many quarters as a way out of the present intolerable impasse, is unfortunately attended with other drawbacks which are quite as serious, although of a somewhat different character. Trade is divided up by modern specialisation into such narrow and clearly defined channels that this specialisation is practically as effective a barrier to barter transactions as the exchange regulations are to normal transactions.

To take a typical example, when an electrical manufacturer exports a motor to Denmark, in nine cases out of ten he does this trade through his agent, who on account of modern specialisation would be exclusively interested in electrical or allied engineering products. However much the idea of barter trading might appeal to the manufacturer, the agent, or the final agricultural user of the English motor in question, it is clear that the agent would be quite useless when it came to a question of specifying or selecting the exact kind of agricultural produce to be taken in exchange, neither would he have the slightest knowledge whether a particular quality or grade would be saleable in England.

Possible Solutions

Even if we assume that these first difficulties have by some means been successfully surmounted, and that finally the British electrical manufacturer (through his agent) has succeeded in disposing of a motor valued at £100 to Denmark, and has received in exchange a shipment of agricultural produce of approximately the same value, it is interesting to speculate how the selling organisation of an electrical concern could dispose of such produce at a profit, or what details or guarantees it would be able to give on the subject of an entirely new class of trade.

Only after fifteen months of trade stagnation have practical alternative methods been evolved. One of the best known of these is the scheme elaborated by the London Chamber of Commerce, designed to cover thirty-five countries and involving a new international currency known as "bartex," which has already received a considerable amount of favourable comment. There is, however, another and somewhat less ambitious scheme that has been evolved for dealing with the exchange difficulties between Great Britain and a single foreign country, which presents somewhat different features, and which is worthy of more attention than it has yet attracted. The plan is designed to overcome the exchange difficulties that are at present rendering trade impossible with Czechoslovakia, a country which in normal times is an excellent market for certain classes of British goods.

The balance of trade was considerably in favour of Czechoslovakia during 1930, with exports to Great Britain totalling approximately eight million pounds sterling against about three and a half millions of imports. This is a point of importance when considering how far a foreign government is likely to support a scheme which has for its object any extension of imports in the present difficult circumstances. The Czechoslovakian Government has recently approved in principle any scheme which has for its object the promotion of "compensation trading," for the very good reason that the export trade to Great Britain is already suffering as severely as our own trade with that country.

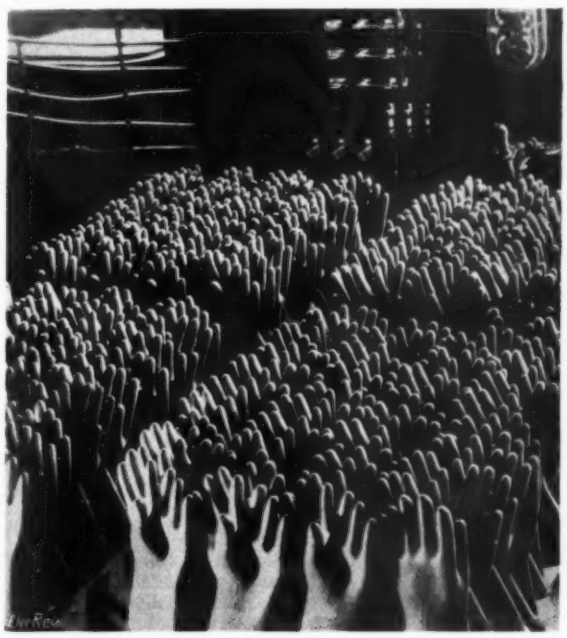
A Special Clearing House

In view of this situation the Czecho-Slovakian Government has lately expressed its willingness for the importers of that country, who by the normal operation of the exchange restrictions are prevented from buying British goods, to resume their former purchases, and to obtain the necessary exchange for payment providing they initiate an approved export of Czechoslovakian products. This is a reversion to barter trading in all but name, and at first sight all the difficulties attending this method of trading will apply.

An association is in the process of formation, however, by means of which the difficulties attending such transactions can be overcome. In all such reciprocal trading there are four main parties to consider, *viz.*, the English exporting manufacturer and his agent in Prague, and corresponding to these the Czech manufacturer and his agent, importer, or customer in London. The proposed scheme is designed to bring all these four parties within the walls of the association, and for their payments to be made through the medium of a special clearing house to be set up. If, as it is hoped, a fairly representative membership is obtained amongst manufacturers who in normal times export not less than £500 per annum to the other country, this will mean that there will be a continuous flow of trade in both directions, so that at any time it will be possible to balance a British export by a Czech export.

Fixing an Exchange Rate

The chief difficulty with which British manufacturers have to contend is that although their prices calculated in Czech crowns have been reduced by approximately 26 per cent. in Czechoslovakia since the depreciation of sterling, there has been no increase in business, owing to the exchange restrictions that were immediately applied with the object of preventing such business. On the other side of the account, it should not be overlooked that the depreciation of sterling has automatically increased the prices of Czechoslovakian products on the English market by about 36 per cent., and has consequently to a great extent put a stop to such trade. The association proposes to overcome both difficulties by means of a special exchange rate, fixed at some point between the present 120 crowns to the £ and par.



This is not unusual unanimity at a political meeting but a batch of linesmen's rubber gloves being tested for the Los Angeles Bureau of Light and Power

The foregoing is merely a rough outline of a scheme which should stimulate British trade in an important European market which at the present time is being left very much to German competition. It will be seen that it has all the advantage of barter (or "compensation trading"), while leaving every trade in its normal channels. The operation of the special exchange rate, although obviously made at the expense of the British manufacturer, will go far to buy the active support of Czech manufacturers, and consequently of the Government, who in the last year have had ample opportunities for recognising the boomerang effect that exchange restrictions and depreciation combined have had upon their own exports to Great Britain. In making the concession British manufacturers will only be giving up a portion of an advantage which is illusory rather than substantial, as the exchange restrictions at the present time prevent practically all normal trading.

Although the projected scheme is exclusively concerned with trade with Czechoslovakia, it is one that can be readily adapted to any country whose trade with Great Britain is of any importance.

In the Courts

IN the King's Bench Division last week before Mr. Justice Talbot and a common jury, Mr. Edward Bakewell, an engineer, electrician and decorator, trading as Bakewell & Son, St. John's Wood, N.W., claimed damages for alleged slander from Mr. W. Stanton, an electrician, who at the material time was manager to Messrs. Herbert Ponton & Co., electrical engineers, Sloane Square, S.W. The plaintiff's case was that the defendant in July, 1931, uttered malicious falsehoods about him to a Mrs. Goetze, by whom the plaintiff had been employed since 1915. In November, 1916, plaintiff had carried out a heating installation at Mrs. Goetze's house. The plaintiff alleged that the defendant in July, 1931, told Mrs. Goetze that there was danger of fire in the installation and the whole of the work would have to be pulled out and redone and that the workmanship and materials were inferior. The plaintiff alleged that he had thereby been gravely injured in his business.

The defendant admitted using most of the words complained of by the plaintiff and pleaded that they were true in substance and in fact although he denied that they bore the meanings put upon them by the plaintiff.

A number of witnesses were called by the plaintiff to testify that the work which he had done and materials used were satisfactory.

At the conclusion of the plaintiff's evidence Viscount Erleigh, on behalf of the defendant, said that apart from the other defences pleaded there was that of privilege, and he submitted that the defendant on that was entitled to succeed as the plaintiff's evidence did not establish that the defendant was actuated in what he did by malice. Counsel said that he proposed to call his evidence before addressing the jury and called the defendant.

After he had been sworn Viscount Erleigh asked his Lordship if he would grant him an opportunity of discussing the matter with Mr. Eales. His Lordship having acceded to the request, Counsel and the parties left the Court and on the return Viscount Erleigh announced that they had been enabled to arrive at a satisfactory settlement of the action. The defendant had come to the conclusion, after hearing the evidence of the plaintiff and his witnesses as to the origin and quality of some of the material, that in face of that evidence it would not be right to persist in the charge he had made against a person in the same line of business as himself. He had, therefore, agreed to withdraw his plea of justification and to apologise for any statements of his which might have caused Mr. Bakewell any mental trouble. It had been decided that there should be judgment for Mr. Bakewell for an agreed sum by way of damages and costs.

Mr. Eales said that Mr. Bakewell had not brought the action for the purpose of making money out of the transaction and as Mr. Stanton had withdrawn his plea of justification and had apologised for his statements he (Mr. Bakewell) was agreeable to the litigation being settled on the terms which had been announced.

His Lordship said he considered that the settlement arrived at was a wise and proper one. He accordingly entered judgment for the plaintiff on the terms endorsed on the briefs.

A Claim for Commission

In the King's Bench Division on January 17th Mr. Justice Branson heard an action brought by Mr. R. F. Fender, Hornchurch, Essex, to recover from Boro Electric Signs £214 as the balance of commission earned by him as salesman in the employ of the defendants. The plaintiff's case was that he was employed by the Franco-British Electrical Co., and in July, 1931, it was orally agreed between him and a Mr. Garbett, acting on behalf of the defendants, that he should be employed as a salesman at a salary of £6 a week and commission of 5 per cent. on the amount of the orders obtained by him. Later the agreement was varied by a provision that the commission payable on orders obtained from Associated British Cinemas, Ltd., should be only 2½ per cent.

The defendants denied liability and pleaded that the agreement was orally altered by which the plaintiff was paid and accepted commission at the rate of 1¼ per cent. upon sales to the cinemas from the months of December, 1931, to January and February, 1932. While denying liability the defendants brought £50 into Court "for the sake of peace and quiet."

His Lordship gave judgment for the defendants with costs. He said he accepted the evidence that the plaintiff was told that he must accept a reduced amount of commission on the cinema orders and ultimately he agreed to do so

Alleged Patent Infringement

In the Chancery Division on January 20th, Mr. Justice Bennett had before him a motion by Pye Radio, Ltd., against Warner's Radio, Ltd. Mr. Wynn Parry, for the plaintiffs, said the motion was for an interim injunction to restrain until the trial of the action or further order the alleged infringement of the plaintiffs' patent by selling their receivers at cost price. It had been agreed to treat the motion as the trial of the action, the defendants submitting to an injunction for the life of the patent in question. The plaintiff company did not ask for an inquiry as to damages.

Counsel for the defendants endorsed this statement and his Lordship said the order would be by consent, the defendant company to pay the agreed or taxed costs of the motion.

"Ozmar" Lamps

In the Chancery Division on January 19th an action against Goodmans (Leeds), Ltd., by the General Electric Co., Ltd., was fixed to be heard by Mr. Justice Eve, but it was settled on terms which included an undertaking by the defendants not to use the word "Ozmar" in connection with electric lamps.

Mr. J. Whitehead, K.C., for the plaintiff company, said the action was for an injunction restraining infringement of trade mark No. 282,003, and passing-off electric lamps not of the plaintiffs' manufacture as and for their lamps, an inquiry as to damages, and delivery up of all infringing articles.

Mr. A. Grant, K.C., for the defendant company, after consulting with Mr. Whitehead, said he had agreed not to use the word "Ozmar" and a sum by way of costs and damages had also been agreed. Mr. Whitehead said he was not asking for delivery up.

His Lordship said that there would be an order staying all proceedings on the terms that had been arranged.

A Receiver's Electricity Supply

On January 19th in the King's Bench Division Mr. Justice Horridge heard an action by the Egham & Staines Electricity Co., Ltd., against Mr. W. Light, of West Drayton, claiming £507 balance of an account for electricity supplied. Mr. Giffen, for the plaintiffs, said that the account covered two periods—November, 1931, to April 11, 1932, when electricity was supplied to the Longford Gravel Co., Ltd., and April 11th, 1932, to May 11th, 1932, during which the current was supplied to the defendant personally. The company was wound up on May 11th and the plaintiffs could not establish their claim in respect of the first period.

Defendant admitted liability to pay £142 in respect of the other period, but claimed that he was entitled to set off that sum against £265 which, he contended, he had paid to the plaintiffs under a misapprehension as to his position in law as receiver for the debenture holders of the company. He accordingly counterclaimed for the balance of £123 and for a mandatory injunction against the plaintiffs to continue to supply him with electricity.

In the result his Lordship held that the defendant was not entitled to set-off and gave judgment for the plaintiff for £142. He said his view was that the plaintiff had wrongfully refused to give the defendant a supply of electricity when he asked for it on his own account, and he adjourned the hearing of the counterclaim regarding the injunction until the parties had had an opportunity of discussing the matter.

New Books

"The Two-Cycle Engine," by C. F. CAUNTER. London: Sir Isaac Pitman & Sons, Ltd. Price: 15s. net.

The passing of Sir Dugald Clerk adds a certain measure of appropriateness to this book for not only was he the discoverer of the method whereby the complete cycle of operations in an internal combustion engine can be effected in two strokes of the piston, but he actually penned a foreword to the book in which he gave a brief history of the cycle and a survey of some of its outstanding merits, while his portrait forms a frontispiece. It would be a fitting monument to the work of a great British engineer if the term "Clerk cycle" could be brought into more general use.

The author first of all amplifies the historical sketch given in the foreword and then describes the various designs of two-cycle engine (we prefer the more accurate appellation "two-stroke cycle engine") which are now on the market. He deals particularly with the smaller types of engine and it is to be regretted that he is not more concerned with the possibility of the two-stroke engine for driving electrical generators, as the more uniform turning effort on the crankshaft makes it particularly suitable for this purpose, although the high-speed compression-ignition types which are now being developed for driving commercial vehicles may point the way to the design of units more suitable for this purpose than the slow-speed types usually employed. In this connection the chapter on port design and its influence on the volumetric efficiency is of peculiar value. This book can be cordially recommended to those interested in the design of such engines, not as solving their problems but as indicating the lines along which they are to be approached. The book is well illustrated.

An Introduction to Physical Science. By CARL W. MILLER. London: Chapman and Hall. Price: 18s. 6d.

The author of this book is associate professor of physics in Brown University, Providence, U.S.A., and he writes primarily for American college students who are taking physical science as part of a more specialised course, *e.g.*, engineering, and who have, as a rule, only a single year to devote to this branch. The subject matter of physics has increased to such an extent during the last quarter of a century

that it is difficult to deal adequately with fundamental principles and at the same time to give a broad survey of modern physics. The author has nevertheless succeeded in this task of compression, and those who are no longer college students, but are desirous of revising their knowledge of physical science, will find the book an excellent means of bringing it up to date. The field covered in the course of the thirty-eight chapters is exceedingly wide.

Physical science cannot be taught without mathematics, and modern physics rests on a foundation of very advanced mathematics; nevertheless a great deal can be accomplished without resorting to the calculus, and the author has confined his mathematics to the level usual in secondary school courses. The historical development of the subject has been followed as far as possible, whilst the introduction of picturesque anecdotes occasionally does much to lighten the pages, and helps to fix the associated principles in the mind of the reader. On account of the wide scope of the book, the treatment is in places somewhat bare, but the numerical examples and exercises at the end of each chapter do a great deal towards making good the deficiency; but it is a pity that the answers to the exercises are not included. A short bibliography at the end of each chapter would have proved useful. The author is gifted with a clear style, and the text, which is illustrated by a large number of excellent diagrams, is well printed; a good comprehensive index is provided.

Shorter Notices

"The *Broadcaster* Radio and Gramophone Trade Annual, 1933." London: *Broadcaster and Wireless Retailer*.—This edition includes a survey giving the number of homes in which a.c. and d.c. is available and those unwired. Areas which have controlled frequency are also indicated. The chart of the supply voltages of the United Kingdom has been entirely revised. Means of preventing electrical interference is a new feature.

"A Technical Description of Broadcasting House." Pp. 105; figs. 72. London: British Broadcasting Corporation. Price: 5s.—This book is an account of the problems which arose in connection with the construction of the building and the plant installed in it. The question of the correct acoustics for concert halls has always been somewhat vague, and although there are in existence many halls giving excellent acoustic conditions, the designs have been based largely on empirical data which is not generally applicable to broadcasting studios. On the electrical side, the design of the microphone amplifiers and switching apparatus does not follow any accepted existing practice, owing to the necessity of obviating all trace of cross-talk and audible electrical interference due to the operation of a large number of switches carrying out many different functions. The book is clearly printed, and the illustrations are very good.

"Le Centenaire des Decouvertes de Michael Faraday" is the title of a 250-page volume which has just been issued by the Société Française des Electriciens, of Paris. The volume opens with a reprint of the address on and tribute to Faraday's work made by Prof. Henri Chaumat, the President of the Société, on the occasion of the visit to Paris in November last year of members of the Institution of Electrical Engineers, the Royal Institution, and the British Association. This is followed by a translation in French of numerous articles on the scientist's life work.

"Annual Report of the Smithsonian Institution, 1931." Pp. 592; illus. Washington, U.S.A.: Government Printing Office.

The latest *Henley Telegraph* is the winter quarterly issue. As usual it abounds in matters of interest to the company's staff and friends, and it contains a reprint of the ELECTRICAL REVIEW'S account of the life and death of its founder, W. T. Henley, published just fifty years ago.

"The *Practical Engineer* Electrical Pocket Book Diary, 1933."—This year book has again been revised, particular attention having been paid to the sections on electric traction, transformers, convertors, d.c. dynamo and alternating currents. The main features of the trolley-bus systems now in use in many towns are outlined in the new edition.

"Electrical Technology," by H. Cotton. London: Sir Isaac Pitman & Sons. Price 12s. 6d.

"Chemical Wave Transmission in Nerve," by A. V. Hill. Cambridge: University Press. Price 5s.

"Wireless, its Principles and Practice," by R. W. Hutchinson. London: University Tutorial Press. Price 3s. 6d.

"Power Economy in the Factory," by J. C. Todman. London: Sir Isaac Pitman & Sons. Price 7s. 6d.

"Piles et Accumulateurs Electriques," by H. H. U. Cross. Paris: Librarie Polytechnique Ch. Béranger. Price 25f.

"Electrical Engineering Laboratory Manual," by S. Parker Smith. London: Oxford University Press. Price 3s. 6d.

"Radioactivity and Radioactive Substances," by J. Chadwick. Price 2s. 6d. "Calculus for Engineers and Students of Science," by J. Stoney. Price 8s. 6d. "Principles of Industrial Management," by E. A. Allcut. Price 10s. 6d. "A First Year of Engineering Drawing," by A. C. Parkinson. Price 5s. London: Sir Isaac Pitman and Sons.

Contractors' Supplies for India

THE possibilities of increasing the demand for United Kingdom products are outlined in a recent Department of Overseas Trade report on the market for electrical contractors' supplies in India.

As the figures below demonstrate, imports of electrical accessories into India show a heavy decline during recent years. The United Kingdom's share has fallen considerably, and in a number of cases orders are going to Continental manufacturers mainly on account of the lower prices quoted. Generally speaking, it is estimated that Continental prices are approximately 15 per cent. below those offered by British manufacturers; in some categories, however, United Kingdom suppliers are able to compete in price while at the same time supplying an admittedly superior article. It is worth remembering that in India consumers seem satisfied with inferior equipment having a much lower standard of general performance and are content so long as it seems to be fulfilling its purpose.

Effect of the Boycott

Apart from the question of price, electrical supplies constitute one of the branches of the import trade in which the boycott has been severely felt. As a result of Congress influence the members of the Indian Electrical Contractors' Association actively boycotted British goods during the most aggressive period of Congress political activity in 1931, and although these influences have disappeared for the most part, the ground lost has not been fully recovered.

A large proportion of the distribution is in the hands of branch houses of the principal overseas manufacturers, but sometimes an importing agent is appointed carrying stocks from which orders are executed as desired. A considerable amount of business is also done through wholesale dealers.

Local production is practically confined to silk lamp shades, inferior types of glass shades, and the manufacture of water heaters and fans on a small scale. Any development in local production apart from the above lines is considered unlikely.

With regard to future development in the demand, progress is likely to be considerably retarded by the widely extended areas over which the supply systems are spread. Outside the more important population centres, the places to be supplied consist for the most part of little more than villages, and the general absence of concentrated populations and the low standard of living are likely to prevent for a long time any considerable increase in the number of supply companies, except in those areas in which hydro-electric schemes have been completed. It is true that the last few years have seen a fair number of new supply companies brought into existence, but this hopeful development has been almost entirely checked as a result of the general retrenchment by public bodies and others following the economic depression.

Climatic Conditions and Progress

Apart from the above considerations, the range of electrical equipment in demand is restricted by climatic conditions. Heating appliances, for example, create practically no demand in some of the biggest centres in Western India like Bombay and Karachi, with the exception, perhaps, of water heaters, kettles and irons. Electric cookers also seem to make little headway in this part of India. Up country, where much lower temperatures are experienced, the absence of supply undertakings prevents the use of radiators. An important outlet for electrical energy is being provided by the increased use of refrigerators; these, however, are mostly of American or Canadian manufacture, as no United Kingdom equipment has yet been found for this market.

It is agreed by most consultants that special propaganda on behalf of British goods is not likely to be of much value at present, and in fact might be definitely harmful as tending to intensify the boycott. What is more likely to succeed is general propaganda with a view to popularising the use of electrical energy for all purposes in those areas already supplied and the taking of such steps as are possible to influence the establishment of new electricity undertakings. We extract from the report the following summary of imports of electrical accessories and fittings during the past three years.

	1929–30.	1930–31.	1931–32.
Electric lighting accessories and fittings (including switches)—	Rs.	Rs.	Rs.
Total	16,58,582	9,45,422	*
From U.K.	10,27,702	5,23,750	3,68,130
,, Germany	3,16,205	2,16,096	2,38,390
,, U.S.A.	1,57,956	60,533	69,172
Meters—			
Total	9,31,235	6,72,365	*
From U.K.	6,91,870	4,52,249	3,35,118
,, Germany	1,20,667	1,27,788	2,03,876
,, Switzerland	46,343	36,019	*
,, U.S.A.	57,034	30,408	*

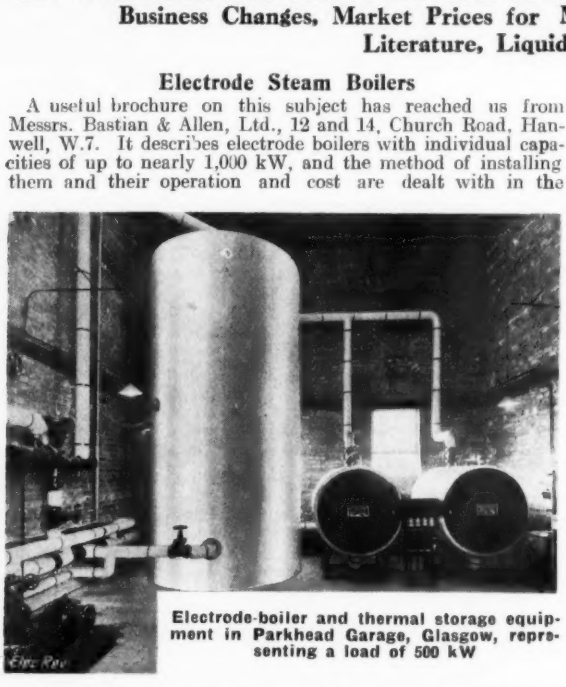
* Figures not available.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources, Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Electrode Steam Boilers

A useful brochure on this subject has reached us from Messrs. Bastian & Allen, Ltd., 12 and 14, Church Road, Hanwell, W.7. It describes electrode boilers with individual capacities of up to nearly 1,000 kW, and the method of installing them and their operation and cost are dealt with in the brochure and in a separate pamphlet. The illustration reproduced herewith appears in the publication. It shows two 250-kW (575-V) circulators and thermal storage equipment supplied by the company for the new Parkhead omnibus garage of the Glasgow Corporation.



Electrode-boiler and thermal storage equipment in Parkhead Garage, Glasgow, representing a load of 500 kW

Irish Free State Electrical Imports

A very quiet tone continues to prevail in the electrical trade in the Irish Free State, the value of imports of electrical machinery, fittings and apparatus during November totalling only £46,112, as compared with £69,307 in the corresponding month of 1931. The appended table gives the imports during the first eleven months of the past year, from which it will be seen that as compared with the corresponding period of 1931 the aggregate showed a decline of £39,809.

	First eleven months. 1931.	1932.
Electrical machinery	£166,892	£152,878
Electric wires and cables	91,402	93,460
Wireless sets and parts	105,646	123,925
Electric lamps and parts	55,103	49,684
Other electrical goods	181,017	147,175
Copper wire	17,033	10,162
Totals	£617,093	£577,284

It will be noticed that the imports of wires and cables and also radio apparatus increased so that the falling-off was due to the other four scheduled items.

Brighton's New Electrical Showrooms

The new electricity showrooms and offices of the Brighton Corporation, in Old Steine, were formally inaugurated by Sir John R. Brooke, vice-chairman of the Electricity Commission, on January 20th. The building and shop fronts were designed and supervised during construction by Mr. W. H. Overton, architect, in collaboration with Mr. W. N. C. Clinch, the borough electrical engineer, and all the materials used are of British or Empire origin and manufacture. It occupies a large corner site, and has a number of display windows, while a glazed canopy has been erected around the front of the building, projecting well over the pavement. The ground floor has been designed for the purposes of a showroom, where apparatus of many types is available for inspection and purchase. A cashier's counter is also situated here.

Leading down from the showroom is a staircase to the basement, which has been designed as an "all-electric" flat. In this are incorporated a lounge hall, dining room, drawing room, bathroom, and a kitchen. On the first floor is a large lecture theatre, with a platform specially equipped for demonstrations and lectures. The remainder of this floor will be occupied by the administrative and clerical staff of the Electricity Department. On the second floor are a number of offices which have been let, whilst others have been reserved for use by the Department. A static sub-station has been provided in a portion of the basement. This is supplied from e.h.p. feeders on a ring main from the North Road sub-station, with a further alternative supply from a sub-station in King's Road. Adjacent to the sub-station is a distribution switch room, at which the electricity supply to the whole building is controlled. The electrical wiring was carried out by Messrs. Keeble, Ltd., who were the general contractors for the building, and "Wylex" switch plugs, made by Messrs. George H. Scholes & Co., Ltd., have been used throughout. The heating of the whole of the building has been carried out by Messrs. Richard Crittall & Co., Ltd., by means of the "Dulrae" panel method. The illumination of the various sections of the building is provided by different methods, and the fittings have been supplied by the Edison Swan Electric Co., Ltd., the General Electric Co., Ltd., Messrs. Falk, Stadelmann & Co., Ltd., and Holophane, Ltd.

In opening the showrooms Sir John Brooke said that the Brighton undertaking embarked on a policy of forward commercial efficiency many years ago when Mr. John Christie formed the "Point Five" group. In 1931-32 Brighton increased its service by 31 per cent. and its domestic load by 12 per cent.

Mr. Clinch said that the whole object of the Brighton Corporation was to treat it as a commercial undertaking and have a supply of electricity available for all likely consumers in the area. Ald. Sir Herbert Carden, a member of the Electricity Committee, said that the Electricity Department's debt had reached £1,800,000 and £900,000 had been repaid. Last year the trading profit was £187,000 and the net profit £47,000. An exterior view of the building and a part of the showroom are illustrated on page 123.

A Swedish Electrical Company's Jubilee

The Allmänna Svenska Elektriska Aktiebolaget (A.S.E.A.), the large electric combine at Västeraas, celebrated on January 17th the fiftieth anniversary of its foundation, which took place on January 17th, 1883. A *Reuter's Trade Service* message from Stockholm states that the original capital was only kr. 84,000, and the staff consisted of five persons; now the capital is kr. 75,000,000, and the staff in Sweden alone numbers 9,000.

Employment During December

According to the *Ministry of Labour Gazette* employment in the engineering industry during December showed a slight improvement, but remained bad on the whole. The total out of work was 261,125, as compared with 266,439 in November, the percentage declining from 27.3 to 26. In electrical engineering employment was moderate, the unemployed numbering 15,418, as against 15,199; the percentage increased from 16.2 to 16.4. There was an increase from 14,654 to 15,008 in the electric cable, wire and lamp manufacturing group; the percentage was 12.8, as against 12.5. The electrical wiring and contracting industry also showed a slight increase, from 4,220 to 4,279 (from 16.8 to 17.1 per cent.).

The Situation in Ecuador

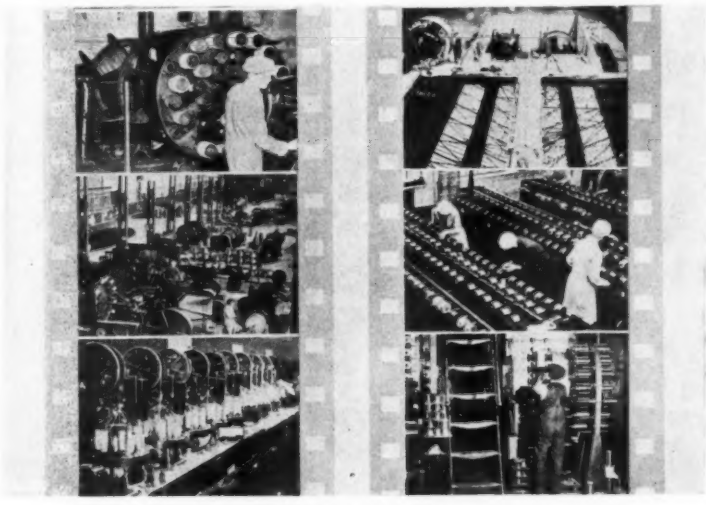
In common with the rest of the world, Ecuador is passing through a bad period, and Mr. R. M. Cohan, British Consul-General at Quito, says in a recent report to the Department of Overseas Trade ((Stationery Office, 1s. 6d. net) that exporters are becoming nervous regarding their sales to the country; in many cases they are insisting on "cash with order." The United Kingdom secures but a small part of the country's import trade. In 1931 the imports of machinery and apparatus (about 20 per cent. of which was electrical) were valued at 3,949,128 sucres (£1=about 21 sucres), and thus showed a severe decline as compared with the two preceding years. The United States and Germany were the principal suppliers, with the United Kingdom third.

The Brazilian Radio Market

The Department of Overseas Trade has issued a report furnished by the Commercial Secretary to H.M. Embassy at Rio

One of the fleet of electric milk vans (General Vehicles Co., Ltd.) employed in its suburban delivery services by the Express Dairy Co.

de Janeiro and the British Consul at Sao Paulo on the market for radio apparatus in Brazil. United Kingdom manufacturers interested in this market would be required to furnish literature on their products, together with prices—illustrated catalogues in Portuguese for preference—so that an opinion can be formed as to the chances of success in this market. There is no market whatever for battery-operated sets, nor for sets working off d.c. mains. No set having a moving-coil speaker will sell. Powerful sets with at least two screened grid valves in the h.f. stages, with single-dial tuning, without regeneration, and fitted with low impedance dynamic speakers, are the kind that sell best. As broadcasting is confined to the wavelengths of 225 to 550 metres, switches for changing over from medium to long waves, with their complications, can be omitted. The sets must be so selective as to separate successfully local stations over 10 kc. and give good loud-speaker volume from stations of 3 to 5 kW 1,000 miles distant.



Some extracts from the B.I. film

Restaurant Lighting

We are informed by Messrs. Troughton & Young, Ltd., that they carried out the whole of the electrical installation at Fischer's Restaurant (described last week on p. 66), including not only the l.p. wiring and control for the 7 kW of neon lighting, but also the whole of the work in connection with the ordinary lighting, representing a further 10 kW.

E.D.A. Activities

During 1932 the British Electrical Development Association organised four major campaigns dealing with electric cooking, hotel lighting, hotel bedroom heating, and electrical Christmas gifts. In connection with the Cooking Campaign which took place between May and July nearly 400,000 booklets, posters, and other items of publicity matter were issued, and, in addition, a series of advertisements appeared in national newspapers. A considerable number of supply undertakings were induced to display 16-sheet posters in their areas.

The Hotel Lighting and Hotel Bedroom Heating Campaigns which were organised in conjunction with E.L.M.A. consisted for the most part of the circulation of direct mail letters and literature on seven successive occasions to 10,000 hotels throughout the country. Arrangements were made also for systematic reports on the existing lighting of hotels to be prepared and submitted to proprietors. For this purpose many E.D.A. Circles and other organisations co-operated with the Association, and upwards of 1,000 hotels availed themselves of reports for the improvement of their lighting.

The Association was responsible for the installation and organisation of the electrical sections of the Building Centre in New Bond Street, while displays of suitable exhibits were arranged at the Royal and other Agricultural Shows, and a number of local electrical exhibitions were also organised by E.D.A. on behalf of various promoters. A special exhibition with demonstrations was also produced in the large booking hall of Charing Cross underground railway station in the early months of the year. The usual series of Salesmanship Conferences were organised in London, Newcastle, and in various parts of the North Midland Area. Attendances at the conferences were well maintained. Special water heating conferences have been held in London, Manchester, and Bristol, and nearly 200 lectures were given by the Association's staff to various audiences. A gazette designed to promote the use of trolley buses has been issued.

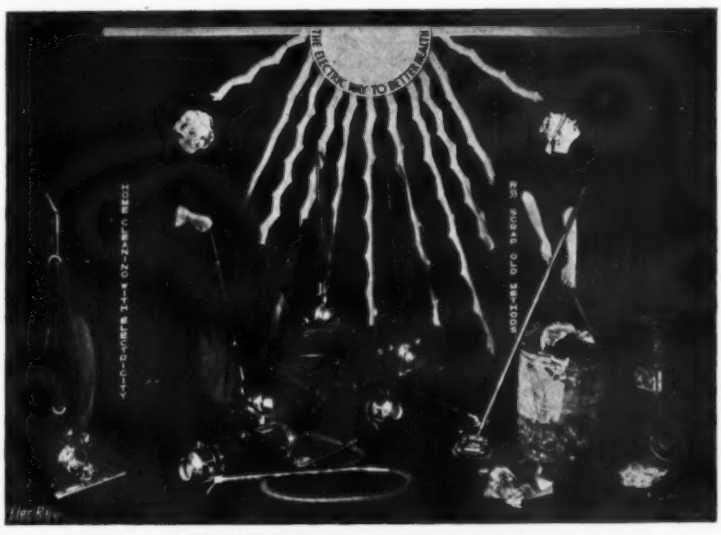
The window display illustrated in the February programme of the Association heralds the approach of the spring cleaning season, home cleaning with electricity being the theme of the display. The Association has endeavoured to show that with inexpensive materials every electrical dealer can arrange an attractive spring window. The suggestions for local advertisements also deal with this subject, while the price list of literature available includes a number of publications dealing with spring cleaning. A poster schedule for 1933 is given showing the subjects for the posters for each month of the year.

Spreading the Electrical Idea

The sound film "'Stranded' in Prescot," produced by British Insulated Cables, Ltd., was shown for the first time on January 20th at the Cambridge Theatre, London, W., to an audience of 800 that was well representative of the electrical industry. It is to be shown later in provincial towns in collaboration with the supply undertakings and the contractors; one municipality has sent two tickets to each consumer for the performance in its own area. "Extracts" from the film are reproduced herewith.

Considered apart from its purely electrical appeal, the film is a good piece of work, and there should be no difficulty in attracting big audiences; these can always be drawn to the "pictures" on any subject, and the present film will help to spread the electrical idea and give publicity to the merits of the local electrical service. The opening "shots," contrasting the methods of providing power transport and lighting in vogue to-day with those prevailing a hundred years ago, effectively bring home how electricity has revolutionised our social habits. An interview between a married couple and a contractor which follows is somewhat conventional, but the subsequent views (slow motion as well as normal) of manufacturing processes are both striking and instructive. We were shown, to the accompaniment of an intelligent running commentary, mills in which 250-lb. bars are rolled to ¼-in. rod 1,250 ft. long and others in which the rod is drawn through trumpet-shaped dies to 0.062 in. and even to 0.001 in. for flexibles.

The insulation of the cores of h.v. cable on laying-up machines (one of which for 33 kV is claimed to be the largest in the country) were specially good photographic efforts, as was also the "maypole dance" of the braiding spindles. Other notable items were the manufacture of tough rubber sheath, extruded by pressure over the cable, and the resistance welders at work. Perhaps the most interesting pictures to the technically minded were those illustrating by excellent photography the making of an 11-kV joint in the streets and the erection of a grid tower within an hour. The film naturally comes to a climax with scenes representing the happy couple explaining to friends the delights of the all-electric home, emphasis being laid on the fact that the wiring had been carried out without upsetting the normal household arrangements.



The E.D.A. February window display

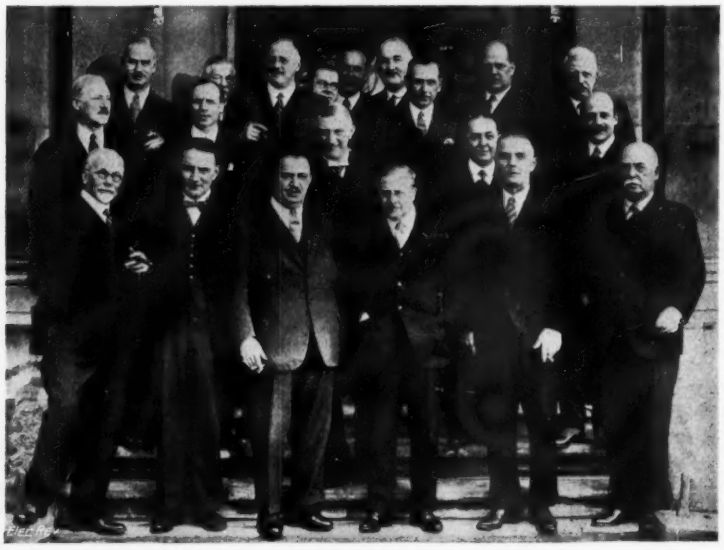
An "S.W.S." Cookery Demonstration

The Mayor of Smethwick (Alderman Mrs. E. M. Sands) and the Mayoress (Miss I. Sands) were recently present at a cookery demonstration at the Shropshire, Worcestershire and Staffordshire Electric Power Co.'s showroom, Bearwood,

Smethwick. It was conducted by Miss N. Matthews, the company's district cooking demonstrator for the Smethwick area, and an ordinary lunch was cooked. She used for the purpose one of the standard cookers that are supplied by the company. The district representative (Mr. T. G. Keeler) presented a cake to the Mayor who, in acknowledging the gift, said that she was greatly interested in anything that rendered assistance to the housewife, made it possible for her to have more leisure, and promoted cleanliness.

The Italian Refrigerator Market

The British Consul-General at Milan and the Consuls at Turin and Leghorn have prepared a report on the markets for small automatic electric refrigerators in Italy, which has been issued by the Department of Overseas Trade. This states that there seems to be no reason why United Kingdom firms should not enter the market provided their apparatus is competitive both in quality and price. The demand for such apparatus is small at present, as the cheapest refrigerator costs 3,900 lire. Before any extensive sale can be expected it will be necessary for an article to be offered at a price not exceeding 1,500 lire.



The P.M.G. at the Coventry telephone works of the G.E.C. Front row from left to right: Sir William Noble, Capt. Strickland, M.P., Sir Hugo Hirst, Bt., Sir Kingsley Wood, the Mayor of Coventry and Col. Wyley

Prices of Materials

Messrs. Edward Till & Co. report, January 25th: India rubber, para fine, 4½d.; ½d. decrease.

Messrs. James & Sheakespeare report, January 25th: No change in the price of copper bars (best selected) sheet and rod, and English pig lead.

Messrs. F. Smith & Co. report, January 25th: Copper (electrolytic) bars and sheets, no change. Copper (electrolytic) wire rods, 6 7/8d., 1/8d. decrease. Silicium bronze wire, 7¾d., 1/8d. decrease.

Rural Transformer Specification

The Brush Electrical Engineering Co., Ltd., announces that reprints of the Specification for Rural Transformers, which has been drawn up by the Overhead Lines Association, are obtainable in leaflet form on application to the company's Falcon Works, Loughborough.

Change of Name

Television Supplies, Ltd., has changed its name to Televisor, Ltd.

Czecho-Slovakian Import Duties

By a Czecho-Slovakian Government Ordinance, dated December 29th, the import duty on electrical ringing, signalling, and railway safety apparatus, radio-telephone apparatus (including microphones), and lightning protection apparatus (excluding lightning conductors) has been increased from 3,000 to 3,600 kronen per 100 kg., for apparatus weighing 5 kg. or more each, and from 6,000 to 7,200 kronen per 100 kg. for apparatus weighing less than 5 kg. each.

A Line Relay Specification

There are several British Standard Specifications dealing with railway signalling apparatus, and a further publication in this series is a specification for tractive armature d.c. neutral line relays. A corresponding specification for track relays was issued some months ago. The two are very similar in general form, but naturally differ as regards the limitations relating to the operating characteristics. The new specification (No. 475) has been approved as being suitable for the requirements of the New Zealand railways. Copies may be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d. each post free.

Social Events

Over 250 people, including representatives of the company from Exeter and Glasgow, attended the recent annual staff dinner of the Macintosh Cable Co., Ltd., Derby. Mr. T. Martin-Harvey, managing director, Mr. C. H. Hampson, general sales manager, and Mr. T. F. H. Birley, assistant sales manager, were unable to be present owing to indisposition, and the chair was taken by Mr. A. Sargent, works manager, who gave the toasts of the firm and the visitors. Mr. P. E. Lavell, assistant to the managing director, and Mr. J. H. Roberts replied. Mr. F. H. Turney, secretary of the company, acknowledged the work of the committee responsible for the arrangements at a concert which followed.

A feature at the annual staff dance of the Skefko Ball Bearing Co., Ltd., held recently at Luton, was a decorative porch, electrically illuminated. The scheme was carried out in black and gold as a background, other colours introduced being cerise and apple green. This colour scheme was employed in the other decorations arranged for the occasion.

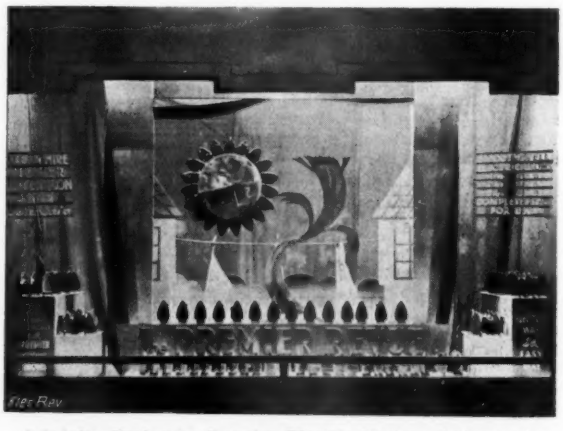
G.E.C. Telephone Works Visit

The Postmaster-General (Sir Kingsley Wood) visited Coventry on January 18th and made a detailed inspection of the telephone works of the General Electric Co., Ltd., together with the comprehensive schemes of welfare work associated therewith. He was entertained at luncheon by Sir William Noble, and the company included Sir Hugo Hirst, Bt. (chairman of the G.E.C.), Councillor O. M. Flinn, Mayor of Coventry, Capt. W. F. Strickland, M.P., Colonel W. F. Wyley, Lt.-Col. J. A. Cole, and Major Watling. Sir William Noble, in welcoming Sir Kingsley Wood, referred to the falling-off in the Government demand for telephone work, and said it was no good the Treasury waiting until a trade revival came along before building new telephone exchanges.

Sir Kingsley Woed, in the course of his reply, dealt with the postal, telegraphic, and telephonic services, and said that the Post Office desired to see an advance made, especially in connection with telephones, during the forthcoming year.

Barbados Tariff Modifications

Modifications have been made in the Barbados customs tariff under the Customs Tariff (Amendment) Act, 1932, No. 2, dated November 11th. The goods affected include electrical apparatus, on which the general duty has been increased from 20 to 25 per cent. *ad valorem*. There is no change, however, in the British preferential rate, which is 10 per cent. *ad valorem*.



A bright display by Premier Electric Heaters, Ltd., at the Hackney Electricity Dept. showrooms

A Steel Conduit Mark

The Association of Steel Conduit Manufacturers has arranged for all tubing manufactured by its members to be distinctively marked as a guarantee of quality. Each length of tubing will bear the trade mark of the Association, and manufacturers may only use it if they undertake to use such materials, and to comply with the form of manufacture as has been laid down by the Association in full knowledge of the requirements of the trade.

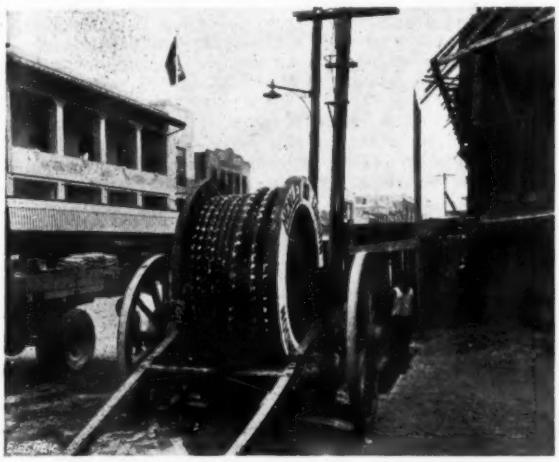
The standard which the associated manufacturers are required to comply with incorporates B.S. Specification No. 31, and all "A.S.C.M." conduit is, of course, entirely of British manufacture.

The present members of the Association of Steel Conduit

Manufacturers are as follows:—Alma & Cranmore Tube Co., Ltd., Wednesbury; H. J. Barlow & Co., Wednesbury; Credenda Conduits Co., Ltd., Oldbury, near Birmingham; Electrical Conduits, Ltd., Walsall; General Electric Co., Ltd.; Griffiths, Isaac & Sons, Wednesbury; Hildick & Hildick, Walsall; James McDougall, Ltd., Wednesbury; Metallic Seamless Tube Co., Ltd., Birmingham; Perfecta Seamless Steel Tube & Conduit Co. (1923), Ltd., Birmingham; Simplex Conduits, Ltd., Birmingham; Steel Tube & Conduit Co. (Middlesbro'), Ltd., Middlesbrough; Stella Conduit Co., Ltd., Bilston; Talbot-Stead Tube Co., Ltd., Walsall; Tipper Brothers, Bradley Bridge, near Bilston, and Walsall Conduits, Ltd., West Bromwich.

A French Inventions Exhibition

During the forthcoming Paris Trade Fair (May 13th-29th) a competition open to all kinds of new inventions will be held as on previous years. There is no entrance fee and various



Henley cables being installed in the rebuilt Emerson Street, Napier, New Zealand, which suffered very severe damage in the 1931 earthquake

prizes will be awarded by a jury for the best exhibits. There will be five sections including one covering electricity and radio and another comprising heating, lighting, and household articles. The London office of the Fair is at 143, Fleet Street, E.C.4.

Trade Announcements

Messrs. Greenwood & Batley, Ltd., inform us that they have purchased recently the goodwill, patterns, and drawings of John Hands & Sons, Ltd., and Hollings & Guest, Ltd., of Birmingham.

The Lovick Johnson Co., 125, Balham High Road, S.W., has been appointed sales representative for London and the Home Counties for the boiler tube cleaning equipment manufactured by Flexotube (Liverpool), Ltd.

Morris Commercial Cars, Ltd., Adderley Park, Birmingham, inform us that they are now in a position to deliver their new one-ton and 15-cwt. trucks.

Mr. H. V. Henniker, A.M.I.E.E., 172, Craigleith Road, Edinburgh, has been appointed by Messrs. Drake & Gorham, Ltd., to represent them in connection with the sale of e.h.p. and l.p. switchgear.

Messrs. Davies and Jones, electrical and radio engineers, 120, King Street, Ramsgate, have removed to larger premises at 97, King Street.

For Sale

Willesden Urban District Council offers for sale d.c. motors. (See our classified advertisements.)

Catalogues Required

Mr. J. Fraser, formerly with the Scottish Southern Electric Supply Co., Ltd., is opening an electrical contractor's business in partnership with Mr. J. C. H. Allen at 25, Island Street, Galashiels, and asks for manufacturers' catalogues and lists.

New Catalogues and Lists

Falk, Stadelmann & Co., Ltd., 83-93, Farringdon Road, E.C.—A comprehensive catalogue (No. 675) of "Climax" conduit wiring systems and accessories, and water-tight and gas-tight fittings. Also catalogue (No. 674) of glass shades, bowl fittings, and units.

Reliance Telephone Co., Ltd., 12-13, Henrietta Street, W.C.—A three-page folder, drawing attention to the company's automatic intercommunicating telephones.

Wingrove & Rogers, Ltd., 188/9, Strand, W.C.—An illustrated and priced catalogue of "Polar" radio condensers.

Hart Accumulator Co., Ltd., Marshgate Lane, Stratford, E.15.—A leaflet entitled "Electric Light from Private Plants with Hart Storage Batteries" outlining the advantages of storage batteries where a public supply is not easily available.

Stanton Ironworks Co., Ltd., near Nottingham.—A stock list of spun and sand cast straight pipes.

Adam Hilger, Ltd., 98, King's Road, Camden Town, N.W.—An article reprinted from *Glass* on a new strainviewer for large glassware made by the company.

Pinchin, Johnson & Co., Ltd., General Buildings, Aldwych, W.C.—A revised edition of the brochure dealing with the company's insulating specialities.

The Metallic Seamless Tube Co., Ltd., Ludgate Hill, Birmingham.—A well-illustrated catalogue of metallic conduits and fittings.

Henry Wiggin & Co., Ltd., Thames House, Millbank, S.W.—A well-produced and illustrated brochure describing the company's works and products.

J. S. White & Co., Ltd., 49, Bridge Street, Deansgate, Manchester.—A catalogue describing the company's ordinary wiring system, a corrosion proof wiring system, and a range of portable handlamps. Also a leaflet giving particulars of a new barrel inspection handlamp.

Lovick Johnson Co., 125, Balham High Road, S.W.—Two catalogues dealing respectively with mechanical and electrical flow meters made by the Brown Instrument Co., Philadelphia, for which the company is the sole British representative.

Philips Lamps, Ltd., 145, Charing Cross Road, W.C.—"Philips News" No. 6, dealing with the company's radio and floodlighting equipment, &c.

Burne-Jones & Co., Ltd., 296, Borough High Street, S.E.—A three-page folder dealing with a new range of "Magnum" short wave adaptors. Lists of short wave stations and Empire broadcasts are included.

British Oil Cleaners, Ltd., 66, Upper Richmond Road, S.W.15.—A booklet on efficient oil cleaning and the economies which it effects, with special reference to the Fox patent electric oil cleaner.

Edison Swan Electric Co., Ltd., 123-5, Queen Victoria Street, E.C.—Publications H.C.842 and A.840, dealing respectively with "Trinity" low temperature heating systems, and the "Cygnet" switch.

Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester.—New and revised leaflets to replace superseded sheets in the company's sectionalised catalogue.

Bankruptcy Proceedings

C. Holdroyd, 87, Buchanan Street, Blackpool, electrical engineer.—The public examination was held recently, at the Court House, South King Street, Blackpool. The statement of affairs showed liabilities of £1,579, and a deficiency of £1,517. The debtor stated that he had an interest in a new invention for artificial lighting, and had been promised a sum of money for doing work in connection with it, which should cover all the liabilities. The Official Receiver stated that the debtor had lost over £100 per month since he commenced trading as an electrical engineer. The debtor said in September last year he purchased a business at Cleveleys paying £500 for it, which he borrowed. Of that amount £350 had been repaid. Proper books of account had not been kept. The Official Receiver remarked that the debtor had drawn £13 per week from a business that was only bringing in £10 or £12 per week. The examination was adjourned.

C. Shepherd, 69, Micklegate, York, radio engineer and dealer.—This debtor's application for discharge was heard at the Law Courts, York, on January 10th. According to the statement of affairs lodged the ranking liabilities amounted to £820 and the assets had realised £191. The Official Receiver explained that the stock had realised only half the amount which had been anticipated. A first and final dividend of 3s. 0½d. in the £ had been paid. The discharge was granted subject to two months' suspension.

G. W. Kempton, trading as "Radio Supplies," Coronation Buildings, Victoria Road, Elland, Yorks.—The first meeting of creditors took place at the Official Receiver's office, 71, Manningham Lane, Bradford, on January 18th. The statement of affairs showed gross liabilities of £1,185 and net assets amounting to £84. The failure was attributed to lack of capital, insufficient turnover and heavy legal and court costs. The case was left in the hands of the Official Receiver, as trustee.

H. Fraser and **R. J. Ardern** (Ardern & Fraser), 29, Church Street, Accrington, Lancs, dealers in electrical and radio appliances.—The public examination was held at the County Court House, Blackburn, on January 18th. A statement of affairs was submitted which showed a joint deficiency of £536, which debtors attributed to lack of capital. The debtor, Fraser, said he had no separate liabilities or assets, whilst Ardern's statement of affairs showed a deficiency of £68. The examination was adjourned to allow debtors to submit a trading account.

C. A. Whittington, 400, Abbeydale Road, Sheffield, electrician and wireless dealer.—At the public examination held at the County Court Hall, Bank Street, Sheffield, on January 12th, the Official Receiver stated that he had not completed his investigations, and the examination was further adjourned. The liabilities amounted to £865, whilst the assets were estimated to realise £94.

E. S. Rees, wireless dealer, 4, High Street, Llanhilleth.—Receiving order made January 13th on debtor's own petition.

G. D. Whitham, electrical engineer, 86, Orford Lane, Warrington.—Receiving order made January 13th on debtor's own petition. Public examination March 3rd at the Court House, Palmyra Square, Warrington.

K. Beeson, electrical contractor, 46, Main Street, Mexborough.—Last day for receiving proofs for dividend February 1st. Trustee, Mr. L. C. Johnson, 14, Figtree Lane, Sheffield, Official Receiver.

Company Liquidations

Fraser Radio, Ltd., 38, Crawley Road, Wood Green, London, N.22, wireless set manufacturers.—The statutory meeting of creditors was held recently at the offices of Messrs. Arthur M. Hobbs & Co., 64, Great Portland Street, London, W.1, when a statement of affairs was submitted which disclosed liabilities of £2,719 and net assets of £421. The creditors appointed Mr. A. M. Hobbs as liquidator, with a committee of inspection.

Barrow Radio, Ltd.—Winding-up voluntarily. Liquidator, Mr. H. Mossop, Ramsden Square, Barrow-in-Furness.

Camille Espir, Ltd.—Particulars of claims by February 20th to the liquidator, Mr. R. G. Sidford, 76, Strand, W.C.

Allerton Electrical Supplies, Ltd.—Meeting, February 22nd, at 76, Merton Road, Bootle, to receive an account of the winding-up by the liquidator, Mr. H. A. G. Langton.

Electricity Supply

Lighting, Domestic, Power

Annan.—OBJECTION WITHDRAWN.—By one vote the Town Council has decided to withdraw all opposition to the erection of overhead wires within the borough.

Ascot.—SPECIAL ORDER.—The Ascot and District Gas and Electricity Co. has applied to the Electricity Commissioners for a Special Order authorising it to supply electricity in certain parishes in the rural district of Cookham.

Barnstaple.—SUPPLY TO COOMBE MARTIN.—The Rural District Council has consented to the use of overhead lines for the supply of electricity by the Ilfracombe Electric Light and Power Co., Ltd., at Coombe Martin, by the Town Council in a portion of the rural area, and by the Bideford and District Electric Supply Co., Ltd., with regard to other portions of the district.

Bedford.—EXTENSIONS.—The Electricity Committee is to extend mains as follows:—Corporation depôt, Commercial Road, £258; Kempston Hardwick, £293; Potton, Sutton Mill Road, £31; Pavenham, Pavenham Bury, £176; Old Warden, Old Warden house, park farm, private aerodrome and lower Hall Farm, £1,190.

Bexhill.—REDUCTION OF CHARGES.—The Electricity Committee recommends that the charges for supplies for thermal water-storage heating between the hours of 4.30 p.m. and 7 p.m. be ¼d. per kWh, plus an appropriate charge for the hire of the necessary time switch; that the charge for power supplies during the two summer quarters be reduced from 1d. to ¾d. per kWh; and that the engineer submit details of charges to large consumers in other towns and particulars of present supplies, when the Committee proposes to go further into the subject.

Bingley.—LOAN SANCTIONED.—The Lighting and Tramways Committee has received sanction to borrow £14,500 for mains, services and meters.

Blackburn.—WHITEBIRK STATION.—The Central Electricity Board will take control of the Whitebirk generating station immediately the new grid sub-station has been completed and the transmission lines are ready. The section of the 132,000-V main transmission line, to which Blackburn station will be linked, is now completed. This line serves one of the most thickly populated areas in the country. It commences at Kearsley and runs to Bolton, Blackburn and Padiham stations, on to Rawtenstall, and back to its starting point, with spur lines from Padiham and Accrington, Nelson and Keighley. When the sub-station has been completed and the switchgear has been installed, the scheme of the Central Board for taking control is expected to be put into immediate operation. The tariff under which electricity will be supplied by the Board has not yet been settled.

Bradford-on-Avon.—OVERHEAD LINE.—The Rural District Council has consented to the Electricity Committee erecting an overhead line from Winsley to Conkwell, and an additional overhead line at Holt.

Bristol.—REDUCED CHARGES.—It is reported that the "unit" charge in the two-part tariff is to be reduced to ½d. per kWh.

Brighton.—CHANGE-OVER.—Regarding the change-over of supply to Stanford Estate from d.c. to a.c., it has become apparent that a considerable saving could be effected by leaving a somewhat larger portion of the network on d.c. than was originally intended. This scheme, while substantially the same as the original proposal in that an a.c. supply will still be afforded to the Barrowfield Estate and the neighbourhood, will necessitate slight modifications to the proposed Droveway sub-station, and the installation of rectifier equipment at a total saving of between £6,000 and £7,000.

Buckie.—CHEAPER ELECTRICITY.—The Town Council has reduced the charges for power as follows:— Up to 5,000 kWh annually, 3d. per kWh, less 12½ per cent.; 5,000 to 10,000 kWh, 2½d. per kWh; 10,000 to 15,000 kWh, 2¼d. per kWh; 15,000 to 20,000 kWh, 2d. per kWh; 20,000 to 30,000 kWh, 1¾d. per kWh; 30,000 to 40,000 kWh, 1½d. per kWh; over 40,000 kWh, 1¼d. per kWh. The electricity output during the past month shows an increase of 46 per cent. as compared with the corresponding period of last year.

Canada.—QUEBEC.—A Toronto correspondent reports that during the past year the Beauharnois Light, Heat and Power Co.'s development on the St. Lawrence River was placed in operation. Four 50,000-h.p. units were installed, two 8,000-h.p. service units have also been erected, while the power station as now completed can accommodate additional units up to a capacity of 500,000 h.p., for which most of the foundations are in place. Part of the output of power is being supplied to the Montreal Light, Heat and Power Consolidated for the Montreal district, and part to the Ontario Hydro-Electric Commission for distribution in Ontario. The Maclaren-Quebec Power Co.'s new development of 130,000 h.p. on Lievre River at Masson, Que., has made good progress. The principal work, including the dam and the one-mile tunnel, has been completed, as well as the power house where the installation of the sets is well advanced. It is expected the plant will be in operation by July of this year; the energy to be developed will go to fulfil a contract with the Ontario Hydro-Electric Power Commission, and the transmission line to the Ontario line is now completed.

Cannock.—FURTHER EXTENSIONS.—The Urban District Council has decided to extend the mains to the Calf Heath district at an estimated cost of £1,100, and also to lay underground mains instead of overhead lines to supply fifty houses at Pye Green, Hednesford.

Chile.—PRICE-INCREASE REFUSED.—The *Monthly Review* of the Bank of London and South America, Ltd., reports that a suggestion made by the Director-General of Electrical Services to the effect that private companies supplying electric light and power should be authorised to raise their tariffs, in view of the heavy losses sustained through the scarcity and high price of oil fuel, has been rejected by the Minister of the Interior, who urges that the companies should modify their plant in such a manner as to use national coal instead of imported oil.

Cockermouth (Cumberland).—SUPPLY EXTENSION APPROVED.—Following a public inquiry in December last the Minister of Transport has now given his consent to the proposals of the Mid-Cumberland Electricity Co. to supply electricity throughout the villages of Stainburn, Great Clifton, Little Clifton, Greysouthen, Brigham and Papcastle, by means of overhead lines.

Congleton.—APPLICATION FOR LOAN.—Application is being made by the Electricity Committee for sanction to a loan of £10,000 for electricity purposes.

Cramlington (Northumberland).—POSSIBILITY OF SUPPLY.—The North-Eastern Electric Supply Co., Newcastle, is canvassing the area in order to ascertain if there is a demand for electricity to warrant the laying of mains.

Croydon.—APPLICATION FOR LOAN.—The Electricity Committee has obtained sanction to a loan of £50,000 for mains extensions.

EXTENSIONS.—The Committee has prepared a scheme for extensions, including mains, plant and buildings at a cost of £104,000.

Darlington.—LOAN.—The Darlington Electricity Committee has decided to apply for sanction to loans of £25,000 for mains and services, £4,000 for meters, and £1,500 for an e.h.p. feeder main.

Dumfries.—ELECTRICAL PROGRESS.—We stated in our last issue that 1,215 applications for supplies had been received by the County of Dumfries Electricity Department, which is shortly commencing its service. Mr. J. S. Pickles, the county electrical engineer, informs us, however, that the number of applications now exceeds 3,000.

Edinburgh.—ELECTRICITY TO REPLACE GAS?—A Corporation sub-committee is considering a proposal to install electric lighting in place of gas in the Corporation houses in the Restalrig and Loch End areas.

Exeter.—SUPPLY PROGRESS.—The Electricity Committee reports that the number of electricity consumers now exceeds 13,000, which is an increase of over 1,600 since March 31st, 1932. If the present rate of connections is continued it is anticipated that over 2,000 new consumers will have been obtained by March 31st this year.

LOAN.—The Committee is to seek sanction to borrow £5,000 for sub-stations and equipment.

EXTENSIONS.—Permission has been obtained to borrow £6,776 for the extension of the supply to the parishes of Exminster, Kenn, Shillingford, and Dunchideock.

HOUSE WIRING.—Sanction has also been received to a loan of £5,000 for house wiring installations. It is stated that 2,220 houses have been wired under the assisted wiring scheme, and further applications are receiving attention.

France.—GENERATION FIGURES.—It is reported that the output of the fifty principal power stations in France, representing about 62 per cent. of the total French production, amounted during the ten months ended October last to 7,227,820,170 kWh as compared with 7,736,290,610 kWh in the corresponding period of 1931, a decrease of 6.57 per cent. Of the total, hydro-electric plants were responsible for 4,061,141,231 kWh and thermal and internal-combustion engine stations for 3,166,678,939 kWh.

Germany.—GENERATION OF ELECTRICITY.—The latest figures relating to the generation of electricity show that the 122 principal power stations produced 1,057,200,000 kWh in August and 1,070,000,000 kWh in September, 1932, as compared with 1,115,600,000 kWh and 1,147,900,000 kWh of the corresponding periods of 1931. The total kWh generated during the first nine months of 1932 amounted to 9,310,200,000 as compared with 10,576,100,000 during 1931.

Glasgow.—MAINS EXTENSIONS.—The Electricity Committee has decided to lay new distributing mains at a cost of £42,369.

HOUSE WIRING.—Under the Electricity Department's scheme 157 houses were wired in December, making the total to date 36,956, and seven hired appliances were installed, making the total 19,060.

Hastings.—LOAN SANCTIONED.—The Town Council has received sanction to loans of £5,000 for sub-stations and equipment, and £10,000 for services.

Keswick (Cumberland).—SUPPLY PROPOSAL SUSPENDED.—The Central Electricity Board has decided to suspend for the time

being a proposal to carry a secondary transmission line on pylons from Penrith to Egremont by way of Keswick.

Leicester.—TARIFFS.—Mr. John Mould, city electrical engineer, has sent us the latest tariffs for the undertaking. The flat-rate tariff is 5d. per kWh for the first 500 kWh, and 3½d. per kWh for all in excess. Heating current costs 1½d. per kWh, and for cooking the charge is 1d. per kWh. The two-part tariff embodies an annual fixed charge of 15 per cent. on houses of a rateable value from £12 to £25, 7½ per cent. on remaining value up to £150, and 2½ per cent. on all remaining rateable value, plus a charge of ½d. per kWh. The sliding scale power tariff is as follows: For the first 2,000 kWh, 1.125d. per kWh; for the next 13,000 kWh, 0.9d. per kWh; for the next 35,000 kWh, 0.81d. per kWh; all over 50,000 kWh, 0.675d. Consumers whose quarterly demand is more than 5 h.p. and whose consumption exceeds 2,330 kWh per quarter, will be allowed to take current for lighting purposes on the above scale of power rates, separately charged, to the extent of 20 per cent. per quarter of the total units used for power. Lifts are charged at 2½d. per kWh. There is also a maximum demand power tariff. Signs or outside floodlighting are charged at £6 per annum per kVA, with a minimum charge of £6, plus ½d. per kWh, or alternatively 3d. per kWh, flat rate. The business-heating tariff is a fixed charge of 35s. per annum, plus 1d. per kWh, or alternatively, 1½d. per kWh with no fixed charge.

London.—HAMMERSMITH.—The net profit from the sale of electricity during the year amounted to £21,695, whilst the net profit from the sale of fittings was £2,364, making a total profit of £24,059. The credit balance of the reserve fund at the close of the year was £14,601, and the unappropriated profits (after allowing appropriations for the assisted wiring scheme, &c.) amounted to £30,367. Capital expenditure during the year amounted to £111,761, making a total of £1,456,401 since the inception of the undertaking. During the year approximately 5,800 wiring installations were provided on consumers' premises under the assisted wiring scheme, bringing the total installations to 15,084. The number of domestic electrical apparatus supplied on hire was 376, bringing the total appliances on hire to 2,409. The total number of consumers at the end of the year was 27,225, as compared with 21,211 for the previous year, an increase of 28.35 per cent.; the amount of electricity sold was 43,392,450 kWh, as compared with 40,781,661 kWh for the year 1930-31, an increase of 6.4 per cent. Twenty-four high- and low-pressure mains extensions were carried out, four additional sub-stations provided, and three sub-stations on consumers' premises were equipped with transformers.

MARYLEBONE.—The Electricity Committee recommends that a supplemental agreement be entered into with the British Broadcasting Corporation in connection with the supply of electricity to the Corporation's premises in Portland Place, whereby the minimum demand of the consumers shall be 300 kW instead of 500 kW, since it has been found that the minimum demand is not likely to exceed 350 kW.

ST. PANCRAS.—The Electricity Committee recommends that the minimum standing charge for electricity supplied from the undertaking to the Central Electricity Board be revised as from January 1st, 1933, to a figure of £1,875 per annum for a guaranteed supply of 1,500 kW, and also that, subject to the consent of the Electricity Commissioners, a high-pressure a.c. main be provided at a cost of £1,135, and a l.p. main at an estimated cost of £990, to Brookfield House, Millfield Lane, Highgate, to deal with any further developments on the west side of West Hill, Fitzroy Park, &c.

BERMONDSEY.—The Electricity Committee is to lay a duplicate feeder to Minto Street sub-station at a cost of £1,400.

JOINT ELECTRICITY AUTHORITY REDUCES CHARGES.—The London & Home Counties J.E.A. recommends the reduction of the flat rate for lighting from 5½d. to 5d. per kWh in Surbiton and Twickenham District. It is also recommended that the charge for prepayment meters in Dorking, Leatherhead, and Weybridge districts be reduced from 1½d. to 1d. per kWh.

Lowestoft.—SUPPLY TO WRENTHAM.—The Electricity Committee has received a letter stating that the Electricity Commissioners have considered the question of authorising Mr. G. A. Bruce, of Great Yarmouth, to supply electricity to an area (including Wrentham) to the South of Kessingland, but that they are of opinion that it would be a retrograde step to authorise the establishment of a small separate undertaking for the area if there were any possibility of its being served as part of some more comprehensive scheme. They have ascertained that the Great Yarmouth Corporation's mains extend to within a short distance of the village of Wrentham, and that, subject to it being granted the necessary authority, that Corporation is prepared to develop the area without delay. The Commissioners suggest that the best method would be for the Corporation to provide the supply in the area under an arrangement between it and the Lowestoft Corporation, with the approval of the Commissioners. The Committee recommends agreement with the proposals.

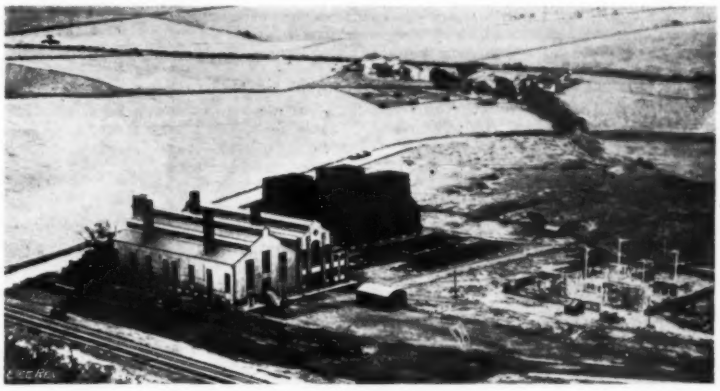
Newcastle-upon-Tyne.—HOUSE WIRING.—The Housing Committee, following representations made to it, has now decided that all houses and bungalows erected in the west end of the city in future shall be wired for electric light by the Corporation. The wiring will cost about £3 per house, while the electricity company will lay the external mains and distribution cables.

Northfleet.—ELECTRIC STREET LIGHTING.—The Works Committee has instructed the surveyor to obtain a quotation from the Gravesend Corporation Electricity Department for the conversion of lamps from gas to electricity for public lighting.

Oxford.—LOAN APPLICATION.—The Electricity Committee is to apply for sanction to a loan of £50,000 for mains and services estimated to meet the requirements of the next two or three years.

Romford.—LIFT INSTALLATION.—The Essex County Council has authorised the provision of a lift at the Romford Institution at an estimated cost of £1,737.

Russia.—THE FIVE-YEAR PLAN.—Up to 1929 there was no power station in the U.S.S.R. of over 75,000 kW capacity, and in 1913 none over 25,000 kW. Now there are ten stations with a capacity of over 100,000 kW capacity. These are: the Kashira (186,000 kW), the Shatura (136,000 kW), the Moscow (107,000 kW); the Red October (Leningrad) (111,000 kW), the Shterovka (Don Basin) (157,000 kW), the Zuevka (150,000 kW), the Dnieprostroi (310,000 kW), the Cheliabinsk (110,000 kW), the Nizhni-Novgorod (158,000 kW), and the Bakinsk (Red Star (109,000 kW). All these stations were constructed or extended during the course of the Five Year Plan, and they supply 33 per cent. of the total electric power of the country. They are all equipped with the most up-to-date plant. At the commencement of the Five Year Plan there were no turbo-generators in the Union of 20,000 h.p. capacity; now there are 50,000 and 62,000 h.p. sets in use.



An aerial view of the Whitebirk power station, Blackburn. The grid sub-station mentioned on page 134 can be seen on the right

Swanage.—TARIFF CHANGES.—The Bournemouth and Poole Electricity Supply Co., Ltd., has offered the following concessions conditional upon the Urban District Council suspending its power to purchase the undertaking for a period of at least forty-two years: To extend the transmission lines from Corfe, so as to deliver into the Swanage Urban District a three-phase h.p. supply; to modernise the existing distribution system; to reduce the present flat rate for lighting from 10d. to 9½d. per kWh; to adopt a two-part tariff, with a "unit" charge of 1½d.; and to reduce the charge to business premises from 10d. to 9d. per kWh. As from the September quarter, 1934, the flat rate for lighting is to be reduced to 8d. per kWh, the running charge under the two-part tariff from 1½d. to 1d. per kWh, and the flat rate for lighting for business premises to 7½d. per kWh. It is understood that the Commissioners have approved these proposals.

Swansea.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at an estimated cost of £250.

Thornton Cleveleys.—LOAN.—The Council has applied to the Electricity Commissioners for permission to borrow £1,000 in respect of an assisted wiring scheme and £450 for cable extensions.

Tottenham.—STREET LIGHTING IMPROVEMENTS.—The Works Committee has arranged with the North Metropolitan Electric Power Supply Co. for the improvement of street lighting in High Road, at an annual additional cost of £960.

Uckfield.—SUPPLY FOR WALDRON SOON.—The Weald Electricity Supply Co., Ltd., has informed the Rural District Council that it is hopeful of designing an overhead line whereby the capital cost in giving a supply of electricity to Waldron will be commensurate with the estimated revenue. The Council on January 16th decided to point out to the company that the two years after the granting of the order had long since elapsed, and that unless the company would give a definite assurance that the work would be put in hand the Council would take the matter up with the Electricity Commissioners.

West Lancashire.—SUPPLY TO BANKS.—The Rural District Council has decided to make a canvass in the township of Banks as the first step in the direction of giving a general supply of electricity.

Wirral.—OVERHEAD LINES.—The Rural District Council has given permission to the Birkenhead Corporation to erect overhead lines at Backford Cross, Great Sutton.

Yarmouth.—LOAN APPROVED.—The Electricity Committee has obtained sanction for a loan of £35,000 for mains services, &c.

Traction

Germany.—RAILWAY ELECTRIFICATION.—Dr. Sigel, president of the German State Railways, states that the electrified section between Munich and Ulm will be brought into operation on May 15th. The electrified suburban line from Stuttgart to Ludwigsberg will also be opened on the same day.

Holland.—DIESEL-ELECTRIC LOCOMOTIVES.—It is announced that the directors of the Dutch Railways have decided to adopt Diesel electric locomotives on various lines, and it is expected that the innovation will be made in the summer of 1934. The lines concerned are those between Amsterdam and Arnhem, Rotterdam and Utrecht, The Hague and Utrecht, and Utrecht and Eindhoven.

Italy.—RAILWAY ELECTRIFICATION.—A programme for extensive railway electrification is being carried out on the State railways. The total cost of the scheme will be about 4,620,000,000 lire, and it will include the main lines from Milan to Cashambria, both *via* Bologna and Florence and *via* Genoa and Pisa, and also the line from Turin to Trieste. There will be the complete electrification of the lines from Genoa to the Simplon and St. Gothard passes, and also the Bolzano-Brennier pass line. The total electrification of the Piedmontese and Tuscan network is also planned, with the augmentation and completion of the electrification of the Udine-Tarviso line with an extension to Trieste. The schemes will entail the electrification of 2,715 miles of track, bringing the total length to 4,108 miles. 1,200,000,000 lire has been reserved for immediate use, and it is hoped to have the task completed in twelve years.

Japan.—PROGRESS OF ELECTRIC TRACTION.—In the course of a recent paper by Mr. Seitavo Iida, it is mentioned that since the first electric tramway was completed in Japan in 1895 electric traction has been adopted on 218 miles of the State Railways, on 2,340 miles of secondary lines, and on 1,297 miles of tramway in the country. The bulk of the lines are of narrow gauge and are operated by d.c. at 600 or 1,500 V.

L.M.S. Railway.—NEW STATION.—A station will be opened at Besses-o'-th'-Barn on the electrified line between Manchester and Bury. The station is named after a district which is almost eclipsed by the town of Whitfield and not, as certain papers have said, after the band!

Russia.—INTRODUCTION OF TROLLEY BUSES.—It is reported that the Soviet People's Commissariat of Economy has decided to carry out some trials during the present year of electric trolley buses in Leningrad and Moscow, the vehicles being imported from abroad.

Walsall.—TROLLEY BUSES REPLACE TRAMS.—The Corporation has decided to increase its fleet of trolley buses with fifteen of the Sunbeam latest six-wheel types. They will be used on the Bloxwich route, which is at present served by tramcars, and will be fitted with regenerative electrical equipment made by the British Thomson-Houston Co., Ltd. The double-decker bodies will each have seating accommodation for sixty passengers.

Communications

Bahamas.—TELEPHONY.—An overseas telephone service linking the Bahamas with North America was inaugurated on January 21st. The ceremony was broadcast in the United States.

Canada.—THE NEW BROADCASTING CORPORATION.—The Radio Broadcasting Corporation held its first regular meeting on January 18th. Its headquarters are in the National Research Building, Ottawa. One of its members attended the recent International Radio Congress at Madrid.

Denmark.—TELEPHONY.—At the end of the fiscal year 1931-32 there were 5,542 route-miles of telephone and telegraph lines in operation in Denmark, representing 78,660 miles of telephone wires and 8,474 miles of telegraph wires.

Germany.—RADIO RELAY SERVICE.—There were 321,805 registered listeners in Bavaria on January 1st, 1933. This number is an increase of 17,345 since October 1st, 1932, and includes those listeners using the special facilities offered outside the service areas of the local stations and listening *via* the wired service over the telephone lines. These numbered 21,245 on January 1st. Listeners making use of the telephone system show a remarkable increase over the total on January 1st, 1932, which was 15,054. In spite of the extra fee of two marks over and above the licence fee, the advantages of the "wired wireless" system are appreciated, reports *World-Radio*, for the Bavarian division of the German Post Office gives the wired system no publicity whatsoever, but use of the system has steadily increased.

Great Britain.—RADIO RELAY EXCHANGES.—The Watford Town Council has appointed a sub-committee to consider the establishment of a radio relay service for the borough. The West Herts branch of the Wireless Retailers' Association has requested the Corporation to defer the granting of any application for six months.

The Accrington Corporation Electricity Committee has drafted conditions and regulations for the supply and installation of services within the borough.

The Newton Abbot Highways Committee has received a deputation of local radio dealers with reference to the establishment of a service. The Committee considers that they should be given the preference in operating such a service, all other things being equal. The Council decided that the surveyor should first obtain details regarding the service which is being operated by wireless dealers at Exeter.

The Broadstairs and St. Peter's Urban Council has received four tenders for the right to provide a service in the urban area, and the offers have been referred to the General Purposes Committee. The firms tendering are Radio Relay Services, Ramsgate; Mr. F. Austen, St. Peter's; Rediffusion, Ltd., London; and Wired Wireless, Ltd.

The Mansfield Town Council has approved of the installation of a relay service in the borough, to be operated by a local company which proposes to erect a receiving station about one and a half miles outside the town.

With regard to an application received by the Greenwich Works Committee, the Town Clerk has stated that there is a Bill before Parliament designed to give local authorities control over the erection of overhead wires, and he considers it desirable to wait until the Council is able to licence or consent to installations of this character.

India.—BEAM WIRELESS DEVELOPMENT.—Telephone communication between England and Poona, India, by means of beam wireless was successfully tested on January 19th, when wireless engineers talked freely to London during the experiment. A service will shortly be opened to the public.—*Reuter* (Poona).

Italy.—RADIO-TELEPHONY.—Radio-telephone communication has recently been established between Rome and Oslo.

Norway.—STATE BROADCASTING.—The Norwegian Storting decided, in principle, on January 20th, upon the conversion of the radio broadcasting service, which is at present carried on by private companies, to a Government undertaking.

Roumania.—RADIO INTERFERENCE.—A recently promulgated law requires that owners or users of any appliance which disturbs radio reception shall adopt the necessary apparatus for the elimination of interference within two years. Those not complying with the regulation are liable to a heavy fine, while those repeating the offence will be forbidden to operate the appliances which disturb radio reception. Owners of radio-receiving sets may claim damages and request the courts to intervene against parties disturbing their radio reception.

United States.—RADIO STATISTICS.—The Radio Division of the Department of Commerce has made public a review of the year's activities. As it has become a part of the Federal Radio Commission, it will not issue a separate report next year, says *World-Radio*. Police radio stations total seventy-nine, compared with fifty-three in 1931, and construction permits have been issued for ten more. There are now 30,374 radio amateurs in the country, an increase of 7,365 over a year ago. Ultra-short waves have stirred a new enthusiasm among the amateur experimenters. Radio beacons along the shores of the United States number 102, an increase of twelve compared with a year ago.

How Ignition Coils Discharge

THE control of ignition-coil discharge characteristics is discussed in a paper which Messrs. G. I. Finch and R. W. Sutton, of the Imperial College of Science and Technology, read before the Physical Society in London on January 20th. A theory has been developed and verified by means of the cathode-ray oscillograph. The secondary discharge consists of two parts: the "capacity" component due to the discharge, upon breakdown of the spark gap, of the energy stored in the secondary capacity; and the subsequent discharge of the electromagnetically stored energy, the so-called "inductance" component. The spark-gap voltage is constant throughout the life of the inductance component, and the inductance-component current is oscillatory, but unidirectional. The theory leads to the conclusion, confirmed experimentally, that the closing of the primary circuit during the life of the inductance component rapidly extinguishes the secondary discharge. A contact-breaker, enabling the duration of opening of the primary circuit to be controlled with accuracy over a range between 0 and 2 m. sec., is described. The elimination of various portions of an ignition-coil discharge, without material effect upon the remainder of the discharge, is also discussed in the paper.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Barnes.—February 6th. Corporation. Traffic control signals. (January 6th.)

Blackburn.—February 27th. Electricity Department. Cable, rubber insulated wire, and meters. (January 20th.)

Cardiff.—February 3rd. Public Health Department. 1,800 electric lighting fittings for Llandough Hospital. (January 13th.)

February 6th. Public Health Department. Staff signalling system at Llandough Hospital. (January 13th.)

Cheadle and Gatley.—February 10th. Electricity Department. Annual contracts for the supply of materials. (See this issue.)

China.—Government Purchasing Commission. Structural steel angles and plates, galvanised iron and copper wire, telegraph instruments, &c. (January 20th.)

Egypt.—CAIRO.—March 22nd. Lighting installation on the new bridge at Minia. (A.X. 11665.)*

Hamilton.—Electricity Department. L.p. cables. (See this issue.)

Hastings.—February 7th. Electricity Department. Materials for twelve months. (January 20th.)

Hemel Hempstead.—February 4th. Town Council. Electric lamps, &c. Specifications from Mr. A. Murray-Smith, borough engineer.

Leeds.—February 21st. Electricity Department. Annual contract for stores. (See this issue.)

London.—HAMMERSMITH.—February 22nd. Borough Council. Stores and material for twelve months. (See this issue.)

STOKE NEWINGTON.—February 13th. Electricity Department. House service meters and l.p cables. (January 20th.)

Manchester.—February 8th. Rivers Department. Overhead line at Davyhulme sewage works. (See this issue.)

Newcastle-on-Tyne.—City Council. Installation of electric lighting in 198 houses on the Ferguson Lane Estate; 158 houses on the Stamfordham Estate; 94 bungalows on the Stamfordham Estate, and 150 houses on the Scotswood Estate. Plans, &c., by Mr. R. E. Roberts, housing architect, 18, Cloth Market.

Plymouth.—Electricity Department. February 6th. Meters, time switches, cables, transformers, and switchgear. (January 13th.)

South Africa.—JOHANNESBURG.—February 10th. Government Supplies Board. Lead-covered cable, switchboard cable, flameproof wire, v.i.r. wire, and 50,000 copper suspension rings. (A.X. 11662.)*

MOSUL BAY.—February 15th. Municipal Council. Generating plant, including water-tube boiler, alternator sets, switchboard panels, 100-kVA transformers and distribution material. (A.X. 11664.)*

Southend-on-Sea.—February 9th. General stores for twelve months. (January 13th.)

Stoke-on-Trent.—March 5th. North-West Midlands J.E.A. Transmission lines and outdoor static transformers. (See this issue.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Birkenhead.—Electricity Committee. Accepted. Switchgear (£1,643).—Metropolitan-Vickers Electrical Co., Ltd.

Croydon.—Electricity Committee. Recommended. Battery for tower wagon (£109).—D. P. Battery Co., Ltd. Two oil coilers (£215).—Serck Radiators, Ltd. Switchgear for various sub-stations (£4,859) and five switches (£830).—A. Reyrolle & Co., Ltd. Transformers (£5,141).—British Electric Transformer Co., Ltd. Isolating switches (£442).—Crompton Parkinson, Ltd.

Denbighshire.—Public Assistance Committee. Accepted. Electric wiring for lighting and bells, together with fittings, for the new Institution at Wrexham (£1,515).—E. H. Jones.

Glasgow.—Electricity Committee. Accepted. Two reconditioned transformers (£270).—Metropolitan-Vickers Electrical Co., Ltd. Two reconditioned transformers (£240).—British Electric Transformer Co., Ltd.

Municipal Transport Committee. Accepted. Electric tyre heater.—Equipment & Engineering Co., Ltd. Reconditioned 12,000-kW alternator.—British Thomson-Houston Co., Ltd.

Government Contracts.—The following contracts were placed by the various Government Departments during December:—

ADMIRALTY (CONTRACT & PURCHASE DEPARTMENT).

Batteries and cells.—Fuller Accumulator Co. (1929); Chloride Electrical Storage Co.

Dry batteries.—Siemens Bros.

Inert cells.—G.E.C.; Fuller Accumulator Co.; Siemens Bros.

Electric travelling crane.—J. Booth & Bros.

Electric overhead travelling cranes.—Cowans Sheldon & Co.

Electrical installation.—G. E. Taylor & Co.

Electric lamps.—G.E.C.; Siemens Electric Lamps & Supplies; B.T.-H. Co.; Ediswan Co.

Electric lighting fittings.—Player, Mitchell & Breedon; Wm. McGeoch & Co.; Gabriel & Co.; Rainsford & Lynes; Revo Electric Co.; Fairless Engineering Supplies; G.E.C.; Engineering & Lighting Equipment Co.; Veritys.

Distribution panels, &c.—Whipp & Bourne.

Switchboards.—G.E.C.

E.h.p. switchgear.—Allen West & Co. Sub-contractors.—Instrument transformers.—B.E.T. Co. Instruments.—Ferranti, Ltd.

WAR OFFICE.

Electric cable.—Henley's; Siemens Bros.

AIR MINISTRY.

Switches and generator.—A. P. Lundberg & Sons.

CROWN AGENTS FOR THE COLONIES.

Cables.—Callender's; Henley's; Siemens Bros.

Static transformers.—Ferranti, Ltd.

POST OFFICE.

Telegraphic apparatus.—Creed & Co.

Telephonic apparatus.—Automatic Electric Co.; Ediswan; Ericsson Telephones; G.E.C.; Siemens Bros.; Standard Telephones & Cables.

Wireless apparatus.—G.E.C.

Cable.—B.I. Cables; Connollys (Blackley); Hackbridge Cable Co.

Conduit and conduit fittings.—Barton & Sons; F. C. Blackwell & Co.; Falk, Stadelmann & Co.; Longmore Bros.

Telephone cords.—L.P.S. Electrical Co.; Phœnix Telephone & Electric Works; Siemens Bros.

Police alarm equipments.—Ericsson Telephones.

Meggers.—Evershed & Vignoles.

Repair of thermionic valves.—Standard Telephones & Cables.

Cable—manufacture, supply, drawing-in and jointing.—Salisbury—Warminster.—Pirelli General Cable Works.

Telephone exchange equipment.—London trunk exchange.—Standard Telephones & Cables. Liverpool trunk exchange.—G.E.C. Sub-contractors: D.P. Battery Co. for batteries; Crompton Parkinson for motor generators; W. Jones & Co. for ringing machines. Shiphay Collaton (Torquay area).—Automatic Electric Co.

Telephonic repeater equipment.—Aldeburgh: Standard Telephones & Cables. Belfast: G.E.C.

H.M. OFFICE OF WORKS.

Lift motor at Inland Revenue office, Edinburgh.—Electric Construction Co.

London.—BERMONDSEY.—Electricity Committee. Accepted. Switchboard (£147).—Crompton Parkinson, Ltd.

HAMMERSMITH.—Electricity Committee. Recommended. Four e.h.p. three-phase, metal-clad switch panels (£860).—J. G. Statter & Co., Ltd. Two 500-kVA, three-phase, 6,600-V oil-cooled transformers (£418).—British Electric Transformer Co., Ltd. One 1,000-kVA transformer (£385).—General Electric Co., Ltd.

ISLINGTON.—Electricity Committee. Accepted. Laying distributor mains in various roads.—Power Lines Construction Co., Ltd. (in place of withdrawn tender).

ST. PANCRAS.—Contracts and Stores Committee. Recommended. Cable for twelve months.—Hackbridge Cable Co., Ltd. (£2,673); Edison Swan Cables, Ltd. (£2,847).

Shrewsbury.—Town Council. Accepted. Electrical equipment and pumping machinery in connection with the new water supply scheme (£10,510).—Harland Engineering Co., Ltd.

Tynemouth.—Housing Committee. Accepted. Electric wiring, &c., at 301 houses on the Ridges Estate (£1,224).—J. Mayo and Co.

Forthcoming Events

Electrical Engineers' Dance.—Friday, January 27th. Grand Hotel, Harrogate. 8 p.m.

Royal Society of Arts.—Friday, January 27th. Adelphi, W.C. 4.30 p.m. "Railway Electrification in India." Mr. F. Lydall.

Students' Dance.—Friday, January 27th. Victoria Halls, Southampton Row, W.C. 7.30 p.m. Joint dance of Graduates and Students of the Institutions of Electrical, Mechanical and Civil Engineers.

Electrical Association for Women.—Tuesday, January 31st. 3 p.m. Opening of new headquarters, Regent Street, W.

Edinburgh Electrical Society.—Wednesday, February 1st. Philosophical Institution, Edinburgh. 8 p.m. "Maintenance and Upkeep of Electrical Plant." Mr. J. Walker.

Electroplaters' and Depositors' Technical Society.—Wednesday, February 1st. Comedy Restaurant, W. Annual dinner.

Electrical Wholesalers' Federation.—Thursday, February 2nd. Savoy Hotel, W.C. 6.30 for 7 p.m. Annual dinner.

Institution of Electrical Engineers.—Thursday, February 2nd. Institution, London. 5.30 p.m. Demonstration by Mr. D. J. Bolton of a two-part tariff indicator. 6 p.m. "An Analysis of the Costs of Electricity Supply and Distribution in Great Britain, with some suggestions as to the causes of and remedies for the slow rate of development." Mr. J. M. Kennedy and Miss D. Noakes. (*North-Western Centre.*)—Friday, January 27th. Engineers' Club, Manchester. 7.15 p.m. Joint meeting with Manchester Association of Engineers. "Progress in Electrical Motor Development." Mr. D. B. Hoseason. Tuesday, January 31st. 7 p.m. Paper by Mr. Kennedy and Miss Noakes. (*North-Eastern Students' Section.*)—Friday, January 27th. Armstrong College, Newcastle-upon-Tyne. 7.15 p.m. Students' lecture. "Oil-filled Cables." Mr. R. E. G. Horley. (*South Midland Students' Section.*)—Tuesday, January 31st. Chamber of Commerce, Birmingham. Joint meeting with I.C.E. and I.Mech.E. students. "Wind Electric Power Plants." Mr. J. Garty. (*Wireless Section.*)—Wednesday, February 1st. Institution, London. 6 p.m. "The Researches of the late Dr. D. W. Dye on the Vibration of Quarts." Mr. E. H. Rayner. (*Meter and Instrument Section.*)—Friday, February 3rd. Institution, London. 7 p.m. "Some Electrical Methods of Remote Indication." Messrs. C. Midworth and G. F. Tagg.

Notes

Basic Principles of Illumination

At the first of the series of conferences for architects on electric lighting held at the Lighting Service Bureau, Mr. W. J. Jones referred to the importance of contrast. Thus the paper of a book reflected 72 per cent. of the light falling on it and the type only 3 per cent., giving a contrast ratio of 24 to 1. Apart from the decorative effect, light and shade were necessary to define the shape of an object, and highly diffused light would hinder vision in a factory. Illumination values varied with the work carried out, but recent researches by Dr. Lythgoe had shown that increase of visual acuity was maintained above 100 ft. candles. To avoid glare the Home Office recommended that no light source greater than 5 ft.-candles per sq. in. should be seen within an angle of 20 deg. below the horizontal, and that when the light source was within 6 ft., the angle of cut-off should be at least 30 deg. The importance of reflectivity of walls was illustrated by a reference to the lecture theatre of the I.E.E., where the dark mass of oiled mahogany reflects only 5 per cent. of the light. To illuminate natural teak to the same value as that given by 1 ft.-candle on a stone finish would require 2¼ ft.-candles. Indirect systems were suitable only with light coloured reflecting surfaces, except where decoration was the main issue. Small rooms cost more to light than large; thus, a room 20 by 20 by 15 ft. might cost 50 per cent. more per unit area than a room with four times the floor area.

St. Michael's Church, Kingstown, Irish Free State, which is now floodlighted with G.E.C. equipment

Fatality

John Casson (40), of Rawtenstall, received a fatal electric shock while painting a 6,000-V cubicle at Clarkholme substation, Waterfoot, on January 16th. The electricity supply was cut off in Lumb Valley, causing a temporary stoppage at two mills. A verdict of "Accidental death" was returned at the inquest, held on January 18th. It was stated that after the accident four cubicle doors were found unlocked, but closed. In the chamber of another cubicle, which was open, was a paint brush, scorched in places. Two chambers had been painted internally, and the paint was wet. The mains superintendent said that Casson was definitely told not to do any internal painting until authorised, either by the mains foreman or himself. The cubicles had been opened with a key kept on a nail at the sub-station. The jury suggested that keys for opening the cubicles should be kept by three authorised persons only.

An E.P.E.A. Dinner-Dance

A warning that the future held serious problems for power engineers in view of the policy of concentration of electricity generation was given by Ald. J. Bell (chairman of the West Midlands Joint Electricity Authority), speaking at the annual dinner-dance of the North-West Midlands Section of the Electrical Power Engineers' Association at Wolverhampton on January 19th. Ald. Bell, who was proposing the toast of "The Association," expressed the hope that the high professional capacity of the Association would be maintained, and that only fully qualified electrical engineers would be admitted. From his experience on the National Joint Board he knew how well the Association served its members, and he realised that it existed to promote peace in the industry.

Responding to the toast, Mr. H. J. Taylor (president of the Association) said he had been considering what effect the Central Electricity Board would have on the supply industry, and he was encouraged by the assurance of Sir Andrew Duncan that members of the Association would sit on the administrative committees. He mentioned that he was going to hand over the reins of office to Mr. D. J. Duffey, who had been unable to accept office last year owing to ill-health. Mr. Duffey, who presided, proposed "The Ladies," and Mrs. F. J. T. Poole responded.

Instruments for Acoustic Measurement

Cinema owners have frequently called upon the Western Electric Co. for advice and recommendations to remedy the bad acoustic properties of their theatres. This science has a wide field of application outside the theatre, and in America the company is at present engaged on a survey of New York on behalf of the city's officials, to calculate the extent of noise and make suggestions for its reduction. For this purpose intricate measuring apparatus was designed, and the first of a similar set of apparatus has just been completed by the company in England. The company anticipates setting up an Acoustic Department which will be available for consultation by architects, publishers, owners of manufacturing plant, public utility companies, and civic institutions where excessive noise is encountered and is considered harmful to their business. The resources of the Bell system laboratories will be available to the personnel of the department.

The British apparatus has been designed at the Western Electric Co.'s Cricklewood laboratories and several improvements have been incorporated. The principal instruments used in noise surveys are the sound meter, for measuring the quality of sound; the reverberation meter, which comprises three distinct units; and the analyser, used for determining the quality of sound.

Cable Operation in North America

A report on cable operation just issued by the N.E.L.A. gives data regarding the performance in 1931 in Canada and the U.S.A. of h.v. cable, joints, and potheads. The average rate of failure for the cables is 6.6 per 100 miles, for joints two per 1,000 joints, and for potheads 3.2 per 1,000. About half of the cable failures due to non-inherent causes, or one-third of all such failures, would probably have been prevented by more care in operation. Mechanical damage and corrosion caused 38 and 15 per cent., respectively, of the total failures in the largest undertakings.

Cables insulated with varnished cambric and rubber averaged 11.5 failures per 100 miles (21.6 for the belted type at 15 to 35 kV) compared with 6.5 for impregnated p.i. cables. About 24 per cent. of cable failures occurred during voltage tests made after the line had gone into service initially. Cables for 66 kV and over whose insulation failed were made in 1925 and earlier; those whose lead sheaths gave trouble were made in 1929 and earlier. For the ordinary type of cables 3.7 repairs per 100 miles were made to sheaths in manholes containing only 37.01 cable. Expansion and contraction caused half the troubles.

Nearly 70 per cent. of the failures due to defective insulation was found in cables more than ten years old. Only 13 per cent. occurred during the first two years. No electrical failure has occurred in cable of the oil-filled type, but minor troubles due to oil leaks have been experienced. During the past five years an increasing proportion of the single and three-conductor shielded cables have had average operating stresses of 40 V per mile or less.

Floodlighting a Grid Sub-station

The outdoor grid sub-station near Barton power station has just been completed. It is of the low double-busbar type and contains ten Metro-Vick 1¼-million-kVA, 132-kV oil circuit breakers, and thirty triple-pole gang-operated isolators. Transformation is through two Ferranti 60,000-kVA transformers. The sub-station is floodlighted at night by equipment consisting of four 1,000-W and five 500-W reflectors mounted at a height of 40 ft., and five 200-W reflectors at 8 ft. The high lamps are mounted on the transmission towers, except in one case, in which two of them are carried on a ferro-concrete lattice pole. Intensive local lighting can be obtained from 230-V a.c., 500-W projector stand lamps connected to three-pin plug points. Two-pin plug points for hand lamps are fitted to the circuit breakers for maintenance work; these lamps are fed from the 110-V battery.

The apparatus for the floodlighting scheme was supplied by the Edison Swan Electric Co., Ltd., and installed by the Metropolitan-Vickers Electrical Co., Ltd. Views of the sub-station appear on page 121.

Fire Resistance Definitions

The authoritative definitions of fire resistance, incombustibility, and non-inflammability of building materials and structures just issued (B.S.S. 476-1932) will avoid anomalies and uncertainties in administering the building laws. Existing legal provisions have been taken into account and methods of test are outlined in the new specification, copies of which are obtainable from the British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d. post free.

The Illuminating Engineering Society

The annual dinner of the Illuminating Engineering Society will be held at the Trocadero Restaurant, Piccadilly, London, W., at 7 for 7.30 p.m. on February 7th. Tickets (price 12s. 6d., exclusive of wine) may be obtained from the honorary secretary, Mr. J. S. Dow, 32, Victoria Street, S.W.1.

Appointment Vacant

Maintenance engineer for Hull Corporation Electricity Department. (See our classified advertisements.)

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of the makers of the following:—

Two-amp 250-V switch with the markings "U.D. Ltd." in a triangle.

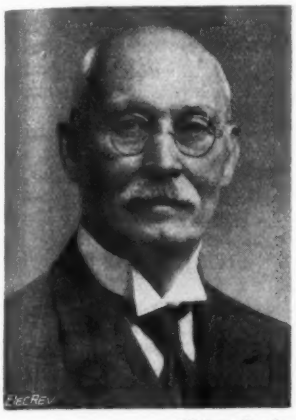
Spherical or parabolic reflectors in magnolium metal.

JASEG electric iron.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Mr. Llewelyn B. Atkinson, one of the best-known personalities in the electrical industry, has been elected an honorary member of the Institution of Electrical Engineers. The announcement was made by the president, Prof. E. W. Marchant, at last week's ordinary meeting of the Institution. Mr. Atkinson became a member of the I.E.E. in 1900 and has since served it very actively. He was vice-president in 1919-20, and in the following year became president. In 1918 he delivered the tenth Kelvin Lecture on "The Dynamical Theory of Electric Engines" which we said at the time "would take its place among the classics of electrical literature." He was Faraday Lecturer in 1929, when he demonstrated the fundamental part played by electricity in the scheme of things. In 1928, the Cable Makers' Association, of which he has long been director, presented his portrait to the Institution to mark their appreciation of his services to the cable-making industry and to electrical engineering in general. The electrical profession and industry will join with us in hoping that Mr. Atkinson will live long to enjoy the much-coveted distinction now bestowed upon him.



[Haines, London

Mr. Ll. B. Atkinson, Hon. M.I.E.E.

Dr. Edouard Branly, the famous French radio worker and inventor of the detecting "coherer" bearing his name, has been promoted to the rank of Grand Officer of the Legion of Honour by the French Government.

Lt.-Gen. Sir George Macdonogh has been nominated by the Federation of British Industries to succeed Sir George Beharrell as president of the Federation for the coming year. Sir George, who has had a distinguished military career, was called to the Bar in 1897. He was a member of the Royal Commission on Local Government, 1923-29, and is a member of the Executive Council of the International Law Association, a Fellow of the Institute of Bankers, and a member of the Council of the Royal Institute of International Affairs. He is either chairman or a director of a number of companies.

[Int. Rotogravure

Lt.-Gen. Sir George Macdonogh, president-elect of the F.B.I.

Mr. Arthur Pollitt has been appointed chief constructional engineer to the London Power Co. in place of Mr. M. Feetham, whose retirement was recorded in our last issue. Mr. Pollitt was educated at the Salford Grammar School and the Royal (Salford) Technical College, and thereafter served his apprenticeship with Messrs. Browett, Lindley & Co., Ltd., of Patricroft, Manchester. After association with a number of other companies in the North and Midlands, he joined Dr. Pearce's staff in the Manchester Corporation Electricity Department as resident constructional engineer at the Barton power station. He commenced with the London Power Co. in January, 1927, as chief assistant constructional engineer.

[Wykeham Studios

Mr. Arthur Pollitt

Mr. G. Scott Ram, O.B.E., M.I.E.E., has been re-elected president of the Association of Supervising Electrical Engineers for the ensuing year.

Mr. Arthur H. Hull, of the Hydro-Electric Power Commission of Ontario, has been nominated by the national nominating committee of the American Institute of Electrical Engineers for the position of vice-president. According to the *Electrical World* Mr. Hull joined the Commission in 1912 as assistant engineer, and for the past twenty years, during the period of the Commission's greatest development, has been engineer-in-charge of station engineering, acting as assistant to the chief electrical engineer, Mr. E. T. J. Brandon. During this time a number of major stations have been erected, including the Queenstown power station, Toronto-Leaside transformer station, and the Chats Falls generating station.

Mr. W. D'Arcy Ryan, an illuminating engineer in the American General Electric Co., and a former director of the company's illuminating engineering laboratory, has been appointed director of illumination for Chicago's coming Century of Progress exposition. Mr. Ryan was responsible for the lighting of the Panama-Pacific International Exposition at San Francisco in 1915.

We regret that in reporting in our last issue the retirement of **Mr. A. Lucas** from the Sheffield district managership of the British Thomson-Houston Co., Ltd., we incorrectly reproduced the portrait of Mr. A. B. Wishart, who is the assistant manager of the company's lamp sales department. Mr. Lucas's is reproduced herewith.

[Walkers, Scarborough

Mr. A. Lucas

Professor J. D. Cormack, C.M.G., C.B.E., D.Sc., has been elected president of the Institution of Engineers and Shipbuilders in Scotland in succession to the late Mr. A. Gilchrist. Prof. Cormack, who has had a long association with the Institution, is an authority on civil, electrical, mechanical, and aeronautical engineering. For a number of years he acted as assistant to the late Prof. Barr, and upon the foundation of the lectureship in electrical engineering in Glasgow University he received the appointment. He was also for a time lecturer in electrical technology in Yorkshire College, Leeds. In 1901 he was appointed Professor of Mechanical Engineering at University College, London, and twelve years later he succeeded Prof. Barr as Regius Professor of Civil Engineering and Mechanics at Glasgow University.

Obituary

Mr. T. C. Pulman.—The death occurred, on January 16th, at his home at Raynes Park, S.W., of Mr. Thomas Charles Pulman, M.Inst.C.E., M.I.Mech.E., a director of Worthington-Simpson, Ltd. Born in 1866, he was apprenticed to Messrs. James Simpson & Co. (which firm was later amalgamated with Worthington's) and later was appointed resident and supervising engineer in connection with their foreign contracts, and from 1887 to 1892 was abroad in charge of their contracts in South America, Gibralta, Holland and Russia. In 1892 he was appointed manager of the company's business in India and the East. On returning to England in 1910, he was appointed a member of the managing committee of Messrs. James Simpson & Co., also manager of their associated firm, the Worthington Pump Co., Ltd., and in 1912 was elected to the board of the latter. In 1914 Mr. Pulman became a director of James Simpson & Co., Ltd., and when the companies amalgamated in 1917 as Worthington-Simpson, Ltd., he was elected to the board, and in 1917 was appointed managing director, which position he relinquished in July, 1930, owing to ill-health. He was a member of the executive and Grand Council of the Federation of British Industries, vice-president of the British Engineers' Association, member of council of the B.E.A.M.A., and of the Electrical Research Association. He was also a member of the Institutions of Civil, Mechanical, and Marine Engineers, and a member of the American Society of Mechanical Engineers.

Mr. G. North.—The death is announced at the age of 35 years of Mr. George W. North, who had been manager at Sutton, Surrey, for Messrs. J. and M. Stone, electrical engineers, for the past eight years.

Mr. T. C. Thompson.—The death at the age of 47 years is announced of Mr. Thomas Charles Thompson, who for the past seventeen years had been electrical engineer with Gibbons Bros., Ltd., Dudley.

Will.—Mr. W. B. Cownie, managing director of the National Electric Construction Co., Ltd., left £50,821 (net personalty £46,310).

Indian Electrical Notes (FROM OUR INDIAN CORRESPONDENT)

IT is learnt that the Bombay-London telephone service will be established soon, and experts are now considering the scale of charges. The number of business calls will be limited by the difference in time between India and England to about three hours each day from 3 p.m. to 6 p.m. or from about 9 a.m. to noon. It is said that some arrangement will have to be made to adjust the office hours in India in such a manner as to enable London firms to get into telephonic communication with India late in the day when all the firms in India now close for the day, namely, from 7 p.m. to 9 p.m. The success of the enterprise, it is realised, will depend upon the scale of charges.

Meanwhile improvements are taking place in the main trunk system, and the link between Bombay and Madras will be completed by March next, so that telephone calls to London will be practicable from any town in India linked to the trunk system.

Broadcasting Policy

A sub-committee appointed by the Madras branch of the European Association has expressed its opinion that any system of broadcasting in India which depends upon the principle of individual listening will be subject to serious limitations because of the poverty of the people which precludes the large majority from purchasing the necessary equipment and the inability of most purchasers to make the minor adjustments upon which successful reception depends. The report of the sub-committee further states that the Government of Madras should take steps for the provision of a broadcasting service throughout the Presidency, and the technical implications of such a scheme have been examined. The report also deals with details of programmes, &c.

Electrical Undertakings in India

According to a list compiled by the electrical engineer to the Government of the Punjab, the total capital invested in electrical undertakings in the whole of India amounts to about Rs. 82 crores and the installed generating capacity of these undertakings is 830,000 kW.

As regards electrical progress in the Punjab, four more licences were granted last year for the generation and supply of electricity in four towns, namely, Sargodha, Montgomery, Campbellpur, and Gujrat. The Lahore Electric Supply Co. has also added to its equipment in view of the expanding demand.

In connection with the Mandi power scheme, in thirteen towns a complete system of local distribution is being provided, by which a direct retail supply will be given, and statutory authority has been obtained for the purpose. The expected public supply will be given from about April, 1933.

Progress in Madras

During the past year six more towns were electrified in the Madras Presidency, according to a recent report, while the peak load of the Madras Electric Supply Corporation has reached 10,000 kW. It is also certain that the Pykara scheme will be completed within the scheduled time and the estimated cost. The investigations and studies of another hydro-electric project, the Periyar, have been completed, and it is understood that the Government is likely to sanction the construction of the works in the near future. The hydro-electric possibilities of the Mettur Dam are being studied, and the plans and investigations are nearing completion. Some useful and interesting data on various catchment areas have been collected by the hydrographic section by means of automatic rain gauges and flow recorders. The proposal is being very seriously considered of creating a National Electricity Board to take over the financing, construction, operation, maintenance, and management of all electrical undertakings in the Presidency.

The constructional work on the Tirupur-Pykara electrification scheme has been completed. The 11,000-V lines were charged and tested at about the middle of last month, the low-pressure lines being put into commission shortly afterwards. The work has been carried out under contract by a Madras concern.

The Mysore State System

According to the administration of the State of Mysore for the year 1931-32, the total electric power generated in the State during the year amounted to 17 million kWh and the gross earnings to Rs. 50,33,000. There were in service 1,763 power installations and 16,700 lighting installations at the end of the year. The gross receipts of the department amounted to Rs. 50,33,000 as against Rs. 50,41,000 in the previous year, and the net profit after meeting depreciation and other charges was Rs. 32,55,000.

As regards the power supply to Mettur, the total outlay during the year was Rs. 9 lakhs and the works connected with the supply of power to Salem and Erode were completed. The electrification of the Tumkur town was also completed at a cost of nearly Rs. 3 lakhs. A considerable number of villages were also electrified and many important extensions were carried out for irrigation purposes, while estimates for the electrification of a number of villages were sanctioned. A special officer was also appointed during the year for popularising the use of power in rural areas, and in consequence there has been a great demand. A special scholarship was sanctioned for experimenting on the possibility of manufacturing electrical transformers locally, and the candidate selected has successfully manufactured small capacity transformers.

British Successes

A review of notable achievements in the past three or four years of British electrical engineering concerns recently appeared in *Indian Engineering*. In the course of this it was stated that in normal times India buys about £4,000,000 of British electrical goods annually. Owing to the trade depression this sum was halved in 1931, but nevertheless 75 per cent. of the total trade was secured by British concerns.

An Engineering Congress in Burma

Early in December the Association of Engineers in Burma held its annual congress at Mandalay. The visits included a tour of inspection of the undertaking of the Mandalay Tramways Co., and among the papers was one on "The Care and Maintenance of Diesel Engines."

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

North Devon Rediffusion Services, Ltd.—Private company. Registered January 20th. Capital £1,000 in £1 shares. Objects: To establish, maintain, and develop a service for the relaying of wireless and radio entertainment programmes to subscribers and others in Ilfracombe and neighbourhood, and to enter into an agreement between the Urban District Council of Ilfracombe and Rediffusion, Ltd. The directors are: Wm. W. Wakefield, 6, St. James's Terrace, Regent's Park, N.W 8; Beverley H. Lyon, 25, Chelsea Park Gardens, S.W.1; Chas. Whitcroft, Inglewood, New Wanstead. Secretary: Chas. Whitcroft. Registered office: Bush House, Aldwych, W.C.2.

Multiplex Agencies, Ltd.—Private company. Registered January 16th. Capital £500 in £1 shares. Objects: To carry on the business of manufacturers of electrical appliances, &c. The directors are: Ethel Walsh, 1, Danvers Street, Rishton; and Joseph Barnes, 12, Mather Avenue, Accrington. Secretary: Ethel Walsh. Registered office: Bradley's Chambers, Abbey Street, Accrington.

Halcyon Radio, Ltd.—Private company. Registered January 21st. Capital, £1,000 in 1s. shares. Objects: To carry on the business of manufacturers of and dealers in wireless receiving and transmitting apparatus, &c. The first directors are to be appointed by the subscribers. Secretary: L. F. Elverstone.

Holmes & Cooper (Horsham), Ltd.—Private company. Registered January 23rd. Capital, £2,000 in £1 shares. Objects: To acquire the business of electrical engineers carried on by Wm. R. Holmes and Robert B. Swain at Horsham, Sussex, and to carry on the same and the business of wireless and mechanical engineers, suppliers of electricity, &c. The permanent directors are William R. Holmes (chairman), 50, East Street, Horsham, and Robert B. Swain, 11, Barttelot Road, Horsham. Registered office: 50, East Street, Horsham.

Loyds (Northern Counties), Ltd.—Private company. Registered January 23rd. Capital, £10,000 in £1 shares. Objects: To acquire the businesses carried on by L. Moss at 10, Albion Place, Leeds, and elsewhere as Loyds', at 340, Hessle Road, Hull, and elsewhere as "L. Moss," and at Groat Market, Newcastle-on-Tyne, as "Randolph," and to carry on the business of manufacturers of and dealers in radio telephone and telegraph instruments, contractors, electrical engineers, &c. The first directors are: Louis Moss and Mrs. Lilian Moss, both of 10, Oak Road, Chapeltown, Leeds. Registered office: Lloyds Bank Chambers, Vicar Lane, Leeds.

Returns of Electrical Companies

Superlamp, Ltd.—Two mortgages for £720 and £425 dated August 23rd, 1929, and February 24th, 1930, respectively, charged on 805, High Road, Leyton, and 62, Turnpike Lane, Hornsey (being properties acquired by the company on December 24th, 1932). Registered pursuant to Section 81 of the Companies Act, 1929). Mortgagees: J. Solomon and M. Solomon, both of 58, Finsbury Pavement, E.C.

Also registered mortgage dated December 24th, 1932, to secure £6,600, charged on premises in Brighton, Hornsey, Deptford, and Leyton. Holders: S. Orgel and C. J. Orgel, 92 and 94, Paul Street, Finsbury, E.C.

Finnell System, Ltd.—Mortgage for £1,500 dated June 14th, 1929, charged on land and buildings at Twyford, Middlesex (being property acquired by the company on December 24th, 1932). Registered pursuant to Section 81 of the Companies Act, 1929. Mortgagee: H. C. Cleaver, Tudor Works, Park Royal, N.W.

Basingstoke Wire Broadcasting Service, Ltd.—Issue on January 17th, 1933, of £200 debentures part of a series already registered.

Electrical & Auto Products (1931), Ltd.—Debenture dated January 13th, 1933, to secure £1,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Simpson Brothers (of Hapton), Ltd., Hapton, Lancs.

Voltron Electric, Ltd.—B. M. Lindsay Fynn, of 1, Ironmonger Lane, E.C., and E. F. Norman, of 19 and 21, Queen Victoria Street, E.C., ceased to act as joint receivers on December 10th, 1932.

Lea, Son & Co., Ltd.—S. Kent, incorporated accountant, of 30a, Pride Hill, Shrewsbury, was appointed receiver and manager on January 16th, 1933, under powers contained in debentures dated June 28th, 1913.

H. E. Ashdown (Birmingham), Ltd.—The nominal capital has been increased by the addition of £9,500 in £1 ordinary shares beyond the registered capital of £500.

Aldersgate Electrical Co., Ltd.—J. E. Gibson, of Chandos House, Buckingham Gate, S.W.1, was appointed receiver and/or manager on January 18th, 1933, under powers contained in debenture dated October 10th, 1932.

Wellington District Electricity Co., Ltd.—Capital, £30,000 in £1 shares. Return dated September 5th, 1930. 27,500 shares taken up. £27,500 paid. Mortgages and charges, nil. A return of allotments made up to December 21st, 1932, shows a further 2,500 shares allotted, payable in cash and fully called up.

E. J. Wilcock, Ltd.—Capital, £1,000 in 500 preference and 500 ordinary shares of £1. Return dated October 22, 1932. 351 preference and 500 ordinary shares taken up. £851 paid. Mortgages and charges, nil.

Holophane, Ltd.—Capital, £100,000 in £1 shares. Return dated October 14th, 1932. All shares taken up. £7 paid. £99,993 considered as paid. Mortgages and charges, nil.

Strange & Sons Electrical Engineering Co., Ltd.—Capital. £200 in £1 shares. Return dated October 21st, 1932. 116 shares taken up. £116 paid and £9 per share premium. Mortgages and charges, nil.

Claude-General Neon Lights, Ltd.—Issue on January 9th, 1933, of £5,000 debentures, part of a series already registered.

Wireless Trading Association, Ltd.—Issue on January 1st, 1933, of £50 debentures, part of a series already registered.

Cutting Bros. & Co., Ltd.—C. J. Pain, 18, Low Pavement, Nottingham, was appointed receiver and manager on January 12th, 1933, under powers contained in debentures dated December 18th, 1925.

City Notes

Baird Television, Ltd., held its annual meeting on January 23rd, Sir Harry Greer (chairman) presiding. In presenting the report and accounts (ELECTRICAL REVIEW, January 13th, p. 69), the chairman said the company had been and still was a development enterprise. The real asset position more or less at the moment was a net immediate cash surplus of £13,500. All other figures on the asset side of the accounts could be compressed into one figure under patents, trade marks, and development account, amounting to, say, £800,000. If they succeeded in popularising this scientific discovery, and he believed they would succeed, then this figure was infinitesimal compared with potentialities. A number of economies had been made. As to future finance, in order to face the future with confidence a further sum of £50,000 was necessary. They had connected with their corporation a powerful group which was definitely interested in television, and as a result of conversations he was satisfied that the necessary capital for future development would be forthcoming. The group had made it clear that upon whatever terms this issue was made they desired that the shareholders be given the first opportunity of applying for any new shares. Only a portion of this new money would be required for equipping a factory, as they had practically concluded arrangements whereby the commercial televisor would be produced and sold with but little capital outlay. When a new scheme of capital reorganisation had been prepared the necessary meeting of shareholders would be called.

The Ever Ready Trust Co., Ltd., held its annual meeting on January 20th, Mr. M. Goodfellow (chairman) presiding. In presenting the report and accounts (ELEC. REV., January 13th, page 69) the chairman said they continued to hold 500,000 eight per cent. cumulative preference shares in Lissen, Ltd. A large increase in sales had been achieved by that company during the past year, and it was anticipated that the accounts would show a record profit. The interim report of the directors of the Ever Ready Co. announced a substantial increase in sales, and they anticipated that the year ending March 31st next would prove to be yet another record. It was probable that they would arrange to market shares in Lissen, Ltd., in the near future. The report and accounts were adopted and a resolution was passed changing the company's accounting year to run from April 1st to March 31st.

Ross Electric Light & Power Co., Ltd.—The accounts to September 30th last reflect the trading operations of the company until the date of the transfer of its undertaking to the Shropshire, Worcestershire and Staffordshire Electric Power Co. The results for this period show a net loss of £485, increasing the revenue deficiency from £6,365 to £6,851.

The Yorktown (Camberley) Gas & Electricity Co. reports a net profit for 1932 of £9,629. It is proposed to pay a final dividend of 3¼ per cent. on the consolidated ordinary stock, making 6½ per cent. for the year, and to carry forward £10,489 (against £10,865 brought in). The gas output showed a decrease of 1.65 per cent., but the electricity output increased by 20.99 per cent.

The Calcutta Tramways Co., Ltd., has published particulars of an issue of £250,000 of 5 per cent. second debenture stock. The proceeds of this issue will be applied as to £215,424 to the redemption of the existing £211,000 seven per cent. second (registered) debentures of the company on May 15th, and the balance will be used for general purposes. Commencing with the year 1938, the company will set aside £2,500 and apply this, with a sum equal to 5 per cent. on the stock redeemed, to repaying the new second debentures by annual drawings at 102, or by purchase in the market at or below that level.

Companies Struck Off the Register.—The names of the following companies have been struck off the Register and they are thereby dissolved:—

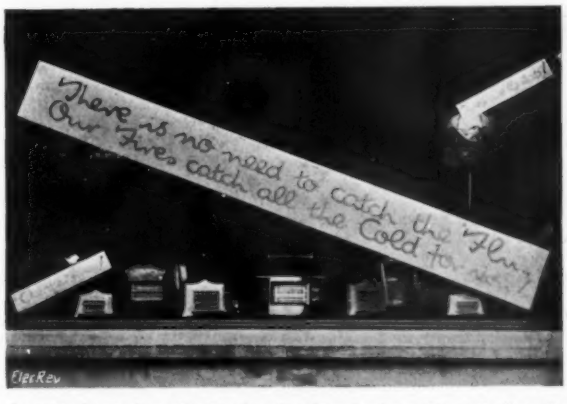
Fors Accumulator Co., Ltd.
London Electric Warehouse Co., Ltd.
Romford Electrical Radio, Ltd.

The London Power Co. has placed £1,000,000 four per cent. debenture stock 1952-72, at 101½ per cent.

Stocks and Shares

TUESDAY EVENING.

THE Stock Exchange markets continue to attract a good deal of public attention. In the annual reports of the leading banks just published, the outstanding feature is the enormous amount of public money that remains on deposit. On this money, a very small rate of interest is paid, and the owners of the capital are constantly urging their Stock Exchange brokers to find them something that will pay them a reasonable rate of return, and, at the same time, offer no great risk of depreciation in price. The fear is that the level now attained by the gilt-edged stocks will have to be reduced when trade improves throughout the country and the world.



A topical window display by the Birmingham Electric Supply Department

For this reason, people are timid of investment in many of the gilt-edged stocks that stand at substantial premiums. On the other hand, markets such as those of Home Railway prior charge stocks, which in days past were regarded as perfectly safe channels for investment, are now seen to be far from secure. The capitalist, large and small, is therefore bemused with the difficulty of conserving his capital, and, at the same time, of obtaining a living rate of interest upon it. Borrowers can command almost their own terms.

London Power New Debentures

The London Power Company placed, a few days ago, £1,000,000 of its 4 per cent. redeemable debenture stock at 101½, for a commission to a Stock Exchange firm of ¼ of 1 per cent. This stock has duly come to market, and the price is 103⅜ to 104¼. Some little remark has been evoked by the difference between the price at which the stock was placed, and that to which it rose within a period of hardly a week. The question was naturally asked as to whether the London Power Company could not have obtained better terms by offering the stock direct to the public through the medium of a prospectus, instead of placing the issue with a private firm. It is possible,

of course, that negotiations over the stock took place before the latest rise in gilt-edged securities. The matter attracts attention, once more, to the point whether a public issue may not prove of greater advantage to the borrower than the system under which a line of stock is sold privately, to be resold, later on, to the public at what is usually a higher price.

When Demand Outstrips Supply

The 4½ per cent. debenture stocks of the Central Electricity and of the London and Home Counties authorities maintain their prices at 106, both being ex the interest payment due on the 1st of next month. Central Electricity fives stand at 111, the Fours at 103. For London electricity companies' debenture stocks, the demand is greater than the supply. Nor is there any indication at the present time of a change in financial conditions which have put up prices to a basis that pays barely 4 per cent. on the money.

Home Rails and Trams

The unauthorised strike of London omnibusmen had the effect of bringing in sellers of Underground Electric Railway shares, the price of which dropped to 19s. Districts gave way a point to 60½, but no alteration occurred in Central London or in Metropolitans. Upon the settlement of the strike, no further change occurred in the prices. Of the London Traction issues, London United Tramway debenture has risen 2 to 67½. London and Suburban Traction preference hold their improvement at 12s., and the company's 4½ per cent. first mortgage debenture stock is changing hands around 100. London General Omnibus 4½ per cent. first debenture stock is quoted at 106, and the company's 5 per cent. cumulative income debenture stock at 112. Metropolitan Electric Tramways 4½ per cent. debenture stocks stands at 94½, and the company's 5 per cent. debenture stock at 93½. South Metropolitan Electric Tramways 4 per cent. debenture, 1940, is officially quoted at 93. According to the *Stock Exchange List*, the last-recorded bargain in this security was at 84 on November 3rd, 1931. British Electric Traction deferred stock has fallen 30 points to 225.

Yorkshire (West Riding) Trams

It may be of interest to notice that Yorkshire (West Riding) Electric Tramways ordinary shares, which very rarely change hands, have recently been done at about 5s. 3d., and the preference on the same day were bought at 17s. The 4½ per cent. debenture stock was marked at 76.

Cape Electric Trams have weakened to 8s. 9d. Brazilian Tractions moved within narrow limits. Falls in Anglo-Argentine Tramways preference shares, of both classes, have left the prices flat at 1s. 9d. The 5 per cent. debenture has declined to 6, yet the 4 per cent. debenture is in steady request at 34.

Electricity Supply Shares

Urban ordinary shares have moved down to 35s. Otherwise the list of electricity supply shares continues to be very firm. Bournemouth and Poole are better at 71s. 3d. Lancashire Light and Power strengthened to 32s. 6d. Electric Supply Corporation have risen to 60s. The list of shares in the London electricity group shows no alteration on the week. Hendons are better at 94s. A rise of 3 in West Gloucestershire ordinary stock lifted the price to 67s. Amongst the Colonials, Victoria Falls went back to 77s. 6d. on the departure of South Africa from the gold standard. In the foreign list, Tokyo Sixes gave way to 63.

Cables and Wireless

The market in Cables & Wireless stocks has shown something of an easier tendency. All three issues are marked down. The only reason for the decline is to be found in the anxiety of certain of the earlier buyers to take the handsome profits which they were able to secure. These they thought it worth while to accept because of the continued uncertainty which envelops the prospects, not so much of the combine itself, as of the probable course of the market. Marconi Marines, which rose 3s. 3d. last week, have reacted a trifle to 35s. American Telephone & Telegraph stock remains at 155½, and International Telephone & Telegraph at 11. Globe ordinary lost ¼, easing off to 11, the preference remaining at 11½. International Automatic Telephones, after being 41s., went back to 39s. 9d. Telephone Properties are 21s. 3d., and Telephone Rentals show no change at 5s. 9d.

The Manufacturing Companies

Something of a halt has been called to the advances which have recently been taking place week by week in the prices of the shares in the manufacturing companies. General Electric ordinary are one exception, showing a rise of 1/16 to 42s. 6d., Johnson & Phillips also being better at 21s. 3d. On the other hand, Callenders at 3½ are 2s. 6d. lower, and Crompton Parkinson ordinary have shed a florin to 22s. 6d. Amongst the equipment shares, Ever-Ready ordinary are 6d. better at 28s. 3d. Electric Constructions rose ¼ to 11s. 3d. In the debenture stocks, it is interesting to notice an advance of 2½ points in Edison Swan 5 per cent. debenture, to 102½. Brush ordinary retain their gain at 37.

The iron and steel market is a trifle reactionary. Babcocks dropped to 42s., but Vickers, after being 6s. 9d., hardened up to 7s. There is nothing doing in the rubber share market.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1930.	1931.	Price, Jan. 24.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	71/3	—	4 4 3
Brompton Ordinary	1	8½	8½	33/6	—	4 3 7
Central Electricity 4½% Deb.	Stock	4½	4½	106	—	4 5 0
Charing Cross Ordinary	1	8½	8½	33/6	—	4 3 7
Chelsea	1	8⅝	8⅝	33/–	—	4 4 10
City of London	1	10	10	34/6	—	4 1 2
Clyde Valley	1	8	7	33/9	—	4 2 10
County of London	1	11	10½	50/9	—	4 2 8
Edmundsons' 7% Pref.	1	7	7	29/6	—	4 15 0
Elec. Dis. Yorkshire	1	9	9	42/6	—	4 4 8
Elec. Supply Corporation	1	11	11	60/–	+⅛	3 13 4
Kensington Ordinary	1	8	8	33/6	—	4 3 7
Lancs. Light and Power	1	6½	7	32/6	+6d.	4 6 2
London & Home Counties 4½% Deb.	Stock	4½	4½	106	—	4 5 0
London Electric	1	9	9	33/6	—	4 3 0
Metropolitan	1	10	10	47/6	—	4 4 3
Midland Counties	1	7	7	33/3	—	4 4 2
Mid. Elec. Power	1	8	8	35/–	—	4 11 5
North Eastern Electric Ordinary	1	6	6	28/6	—	4 4 3
Do. 7% Pref.	1	7	7	31/6	—	4 9 0
Northampton	1	10	10	50/–	—	4 0 0
Notting Hill 6% Pref.	10	6	6	12½	—	4 14 0
North Met. Elec. 6% Pref.	1	6	6	28/6	—	4 4 3
St. James' and Pall Mall	1	8	8	33/6	—	4 3 7
Scottish Power	1	8	8	35/–	—	4 11 5
South London	1	8½	8½	33/–	—	4 4 10
Urban Ordinary	1	7	7	35/–	—⅛	4 0 0
Westminster Ordinary	1	8½	8½	33/–	—	4 4 10
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	16/3	—	0 4 8
Yorkshire Elec.	1	8	8	40/–	—	4 0 0
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	82½	—	4 17 0
Metropolitan	,,	3½	2½	61	—	4 2 0
Do. District	,,	5	4½	60½	—1	7 8 9
Underground Electric	1	8	7	19/–	—6d.	7 7 4
TELEGRAPH AND TELEPHONES.						
American Tel. & Tel.	$100	9	9	155½	—	5 15 9
Anglo-Am. Tel. Pref.	Stock	6	6	105½xd.	—	5 13 9
Do. Def.	,,	1½	1½	25xd.	—	6 0 0
Cables & Wireless 5½% Pref.	,,	5½	2¾	82½	—1	3 6 8
Do. A 7½% Ord.	,,	—	Nil	28	—1½	—
Do. B Ord.	,,	—	Nil	11	—1	—
Globe Tel. and T. Ord.	10	8½	Nil	11	—½	—
Do. do. Pref.	10	6	6	11½	—	5 7 8
Great Northern Tel.	10	20	20	28½	—	7 0 6
Marconi-Marine	1	15	10	35/–	—9d.	5 14 3
Oriental Telephone Ord.	1	12	12	3	—	*4 0 0
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	—	—	1/9	—1 6	—
Do. do. 2nd Pref.	5	—	—	1/9	—2/–	—
Do. do. 5% Deb.	Stock	—	—	6	—1	—
British Electric Traction Def. Ord.	,,	5	5	225	—30	—
Do. do. Pref. Ord.	,,	8	8	132½	—	6 0 9
Brazil Traction	100	—	—	11½	—	—
Brit. Columbia Elec. Rly. Pfce.	Stock	5	5	102½	+2	4 19 6
London & Sub. Trac. 5% Pref.	1	Nil	Nil	12/–	—	—
London United Tram Deb.	Stock	4	4	67½	+2	6 2 2
Mexico Trams, 5% Bonds	—	5	5	47/½	—	10 10 6
Mexican Light Common	100	Nil	Nil	10	—	—
Do. 7% Pref.	100	7	7	15	—	—
Do. 1st Bonds	—	5	5	70	—	7 2 10
Victoria Falls Ord.	1	15	15	77/6	—⅛	3 15 9
Yorkshire (West Riding)	1	Nil	Nil	5/–	—	—
MANUFACTURING COMPANIES.						
Assoc. Elec. Ord.	1	6	4	19/6	—6d.	4 2 0
Do. Pref.	1	8	8	32/–	—	5 0 0
Babcock & Wilcox	1	14	14	42/–	—6d.	—
British Aluminium Ord.	1	10	5	23/9	—	4 4 0
British Insulated Ord.	1	15	15	68/9	—⅛	4 7 3
Brush Ord.	Stock	5	Nil	37	—	—
Callender's	1	15	15	3½	—¼	4 16 0
Do. 6½% Pref.	1	6½	6½	28/3	—	4 12 0
Crompton Parkinson Ord.	5/–	30	24	22/6	+⅛	5 0 0
Do. 8% Pref.	1	8	8	30/–	—	5 6 8
Edison-Swan 1st Pref.	1	7½	7½	24/6xd.	—9d.	6 2 5
Do. 5% Deb.	Stock	5	5	102½	+2½	4 17 7
Electric Construction	1	Nil	Nil	11/3	+¼	—
Enfield Cable Ord.	1	25	25	4½	—	5 8 1
English Electric	1	Nil	Nil	12/6	—	—
Do. do. Pref.	1	Nil	Nil	16/6	—	—
Ever Ready	5/–	35	35	28/3	+6d.	6 4 0
Ferranti Pref.	1	7	7	23/9	—	5 18 0
G.E.C. Pref.	1	6½	6½	29/–	—	4 9 8
Do. Ord.	1	10	8	42/6	+⅛	3 15 4
Henley's	1	30	30	6⅛	—	4 15 0
Do. 4½ Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber	1	Nil	Nil	2/6	—	—
Johnson & Phillips	1	10	5	1⅛	+⅛	4 14 1
Siemens Ord.	1	7½	7½	27/–	—6d.	5 11 1
Telegraph Construction	£1	Nil	Nil	16/3	—	

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1931

12074. "Sound transmitters." J. Pintsch Akt.-Ges. April 25th, 1930. (385602.)

14923. "Apparatus for the conversion of electrical oscillations into mechanical oscillations." General Electric Co., Ltd., and D. A. Oliver. May 20th, 1931. (385603.)

18294. "Electric storage batteries." J. J. Drumm, and Drumm Battery Co., Ltd. June 24th, 1931. (385614.)

18311. "Junction boxes for electric cables." General Electric Co., Ltd., and H. W. Cron. June 24th, 1931. (385616.)

18571. "Method of and apparatus for electrically operating or controlling road-traffic signals automatically." W. H. Scott, and S. E. Glendenning. June 26th, 1931. (Cognate application 23999/31.) (385618.)

18583. "Radio receiving apparatus." A. V. Tomlinson (Union Switch & Signal Co.). June 26th, 1931. (385619.)

19768. "Vacuum or gas-filled electric discharge tubes." W. L. W. Schallreuter. July 9th, 1931. (385645.)

20003. "Permanent magnets." Swift, Levick & Sons, Ltd., G. D. L. Horsburgh, H. Levick & Darwins, Ltd. July 11th, 1931. (385643.)

20489. "Contacts of electrical switches." J. A. Crabtree. July 17th, 1931. (385649.)

21133. "Electric power-converting apparatus." British Thomson-Houston Co., Ltd. July 30th, 1930. (385653.)

21487. "Electric tumbler switches." H. S. Cooke. July 28th, 1931. (385656.)

21563. "Electric discharge devices." British Thomson-Houston Co., Ltd. August 2nd, 1930. (385898.)

22592. "Electric cut-outs." International General Electric Co., Inc. August 9th, 1930. (385659.)

24559. "Track-circuit signalling apparatus." British Power Railway Signal Co., Ltd., H. Tinsley, and D. C. Gall. September 1st, 1931. (385666.)

24652. "Electrical amplifier of high power." P. H. Taylor and E. Lavington. September 2nd, 1931. (Cognate application 25423/31.) (385667.)

24661. "Thermally operating electric switches." M. Payne and British Thermostat Co., Ltd. September 2nd, 1931. (385668.)

26524. "Burglar alarms." H. Line. September 23rd, 1931. (385675.)

27465. "Protective systems for Ljungstrom generator sets." Siemens-Schuckertwerke Akt.-Ges. October 20th, 1930. (385682.)

29115. "Electric relays." Siemens Bros. & Co., Ltd., and R. Barker. October 20th, 1931. (385692.)

29745. "Electric cables." C. J. Beaver, T. J. Fairfield, and W. T. Glover & Co., Ltd. October 27th, 1931. (385695.)

30454. "Insulating devices for exposed electric conductors." H. R. Allen and Croydon Cable Works, Ltd. November 3rd, 1931. (385699.)

30462. "Electric interlocking plants for railways." Telefonaktiebolaget L. M. Ericsson. November 25th, 1930. (385700.)

31798. "Switches for use in connection with overhead electrical transmission lines." J. L. Gaved. November 17th, 1931. (385713.)

32299. "Electrically controlled apparatus for performing functions at timed intervals." Kodak, Ltd., and W. Buckstone. November 21st, 1931. (385716.)

33548. "Manufacture of wire-wound coils and the like." W. R. Bullimore. December 3rd, 1931. (385721.)

33311. "Electricity meters." Allgemeine Elektricitäts Ges. December 6th, 1930. (385723.)

34919. "Quick-action electrical switches or combined switches and fuses." Midland Electric Manufacturing Co., Ltd., and W. L. Barber. December 17th, 1931. (385734.)

1932

1461. "Method of and apparatus for electrolysis with the use of a mercury cathode." K. W. Palmaer. April 29th, 1931. (385756.)

1519. "High-tension electric switch, particularly adapted for X-ray devices." C. H. F. Muller Akt.-Ges. January 21st, 1931. (385757.)

2020. "Apparatus for multiplying the frequency of electrical oscillations." General Electric Co., Ltd., and E. C. S. Megaw. January 22nd, 1932. (385762.)

3703. "Waterproof electric heating-pad or the like." R. Apt. February 10th, 1931. (385770.)

4431. "Radio-receivers." B. J. Grigsby. February 15th, 1932. (385776.)

4951. "Cable connectors for electric cables of the oil-filled type." W. Brown. February 19th, 1932. (385779.)

6832. "Lamp signalling apparatus, more particularly for railways." Orenstein & Koppel Akt.-Ges. October 1st, 1931. (385793.)

6930. "Buzzer arrangements for converting direct current into alternating current." Siemens & Halske Akt.-Ges. October 8th, 1930. (Divided application on 10839/31.) (385794.)

8312. "Grip for use in straining and jointing electrical conductors, wires, and the like." B. McMahon. March 21st, 1932. (385800.)

8337. "Process for preparing electric insulating hose." Klasing & Dettmer's Elektroisolier-Ges. March 24th, 1931. (385802.)

9024. "Electric transformers." International General Electric Co., Inc. March 28th, 1931. (385806.)

9677. "Production at a distance of ratio computer indications." Totalisators, Ltd. (G. A. Julius, and A. F. Julius). June 15th, 1931. (Divided application on 17385/31). (385640.)

9695. "Electric liquid-heaters." British Thomson-Houston Co., Ltd. April 7th, 1931. (385809.)

11340. "Trolley wheels and heads for collecting electricity." W. V. Edwards. April 20th, 1932. (385816.)

11996. "Device for protecting movable electric conductors from tensions, stress and distortion." M. Paufler. April 26th, 1932. (385825.)

13152. "Ultra-violet radiation apparatus." Claude-Lumière, Soc. Anon. pour les Applications des Gaz Rares A. L. Lumière, Procédés G. Claude. December 26th, 1931. (385835.)

14697. "Motion picture projecting and sound-reproducing apparatus." V. E. La Thomas. June 1st, 1931. (385845.)

14802. "Key-operated devices for switching off electric lights in rooms and the like." A. Fiedelbaum. January 19th, 1932. (385847.)

14894. "Telegraphic and similar repeating systems employing vacuum tube amplifiers." Electrical Research Products, Inc. June 25th, 1931. (Addition to 315836.) (385848.)

15941. "Speed-regulating devices for electric motors." J. H. Robertson. February 29th, 1932. (385856.)

15974. "Electric filter circuits, particularly for use with thermionic amplifiers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 15th, 1931. (385858.)

16706. "Short-wave receivers." Marconi's Wireless Telegraph Co., Ltd. June 12th, 1931. (385863.)

17677. "Conversion of polyphase current into single-phase current." Akt.-Ges. Brown, Boveri et Cie. June 22nd, 1931. (385868.)

19551. "Flexible tubular electrical insulating material." H. D. Symons & Co., Ltd., and A. M. Roach. July 11th, 1932. (385883.)

21324. "Electric switches for preventing fire on vehicles after an accident." L. Sermet. August 4th, 1931. (385897.)

21943. "Electric motors." International General Electric Co., Inc. August 4th, 1931. (385899.)

23723. "Fusible cut-outs." British Thomson-Houston Co., Ltd. August 24th, 1931. (385905.)

26934. "Synchronisation devices for television and the transmission of moving pictures or of pictures derived from kinematograph films." Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. September 28th, 1931. (385920.)

27446. "Cathode-ray tubes." International General Electric Co., Inc. October 3rd, 1931. (385923.)

28749. "Synchronous electric motors." International General Electric Co., Inc. October 14th, 1931. (Addition to 385899.) (385926.)

30793. "Sound transmitters." J. Pintsch Akt.-Ges. April 25th, 1930. (Divided application on 12074/31.) (385641.)

Trade Mark Applications

The following are among recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from January 18th:—

Permundum Varnishes (lettering and design). No. 536876. Varnishes.—Enfield Cable Works, Ltd., Lincoln House, 296-302, High Holborn, W.C.1.

Dryetter. No. 537337. Class 6. Machinery of all kinds and parts thereof.—Martin Brothers Electric Co., Cleveland, O., U.S.A. (British representatives: Marks & Clerk, 57-58, Lincoln's Inn Fields, W.C.2.)

Kalite. No. 532183. Class 8. Electric cables. No. 532184. Class 40. Wire insulated or sheathed with india rubber and used for electrical purposes.—Anchor Cable Co., Ltd., Hamilton House, Victoria Embankment, E.C.4.

The Pine Brand Trade Mark (lettering and design). No. 536265. Class 8. Sound reproducing and recording apparatus, radio-telephonic apparatus, and radio-telephonic apparatus in combination with gramophones and parts thereof.—J. T. Coppock, 61-67, Old Street, E.C.1.

Electroviver. No. 537046. Class 11. Electrical contrivances (not medicated) for surgical or curative purposes.—E. G. S. Hawkins, 50, Sussex Square, Brighton.

Klimax. No. 536440. Class 13. Electric lamps (ordinary).—O. & M. Kleeman, 46-49, Redcross Street, E.C.1.

Dioxsil. No. 524566. Class 15. Fused silica articles, all for chemical or electrical purposes, and fused silica lamp globes.—Jenaer Glaswerk Schott & Gen, Jena, Germany. (British representatives: Carl Zeiss (London), Ltd., 37-41, Mortimer Street, W.1.)

Roxon. No. 536122. Class 50. Electrical fittings, &c., all made of synthetic resin or of condensation products of phenol and formaldehyde or like compositions.—Roxon, Ltd., 71, Queen Street, E.C.4.

The Home Office Industrial Museum

DURING the past year a number of additional exhibits have been installed at the Home Office Industrial Museum. The principles of heating, and the main considerations to be taken into account when choosing a heating system which will be efficient and economical for a particular works or building, are dealt with, and various heating appliances and methods of arranging the installations are illustrated. Several devices have recently been invented which will indicate to a crane driver when the maximum safe load is reached. One of these is now shown at the Museum on a small crane in the Building Exhibit, together with drawings of some others. The Electricity Exhibit has been largely rearranged, and a number of the items have been replaced by more up-to-date apparatus. A model transformer kiosk, or sub-station, illustrates various features to be aimed at in the design of these structures. Numerous other items have been added to various machinery and other sections of the Museum, and the collection of photographs has been considerably extended.

This Museum, which is a permanent exhibition of up-to-date mechanical and other arrangements for promoting the safety, health, and welfare of industrial workers, is situated in Horseferry Road, Westminster, and is open (free) each weekday from 10 to 1 and from 2 to 4. Applications for evening visits by parties or for the use of the lecture hall should be addressed to the Director of the Museum at the Home Office.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberystwyth.—Municipal pavilion (£19,792); W. Higley, builder, Shrewsbury.

Accrington.—Alterations to 93, Blackburn Road; Prices (Tailors), Ltd.

Alnwick.—Modernising of the Poor Law Institution; W. W. Tasker, county architect, 17, Claremount Road, Newcastle-on-Tyne.

Alton (HANTS).—Houses (50), Park Close and Landsdowne Road; Council's surveyor.

Amblecote.—Houses (24); U.D.C. surveyor. Nurses' home, Ciorbett Hospital; secretary.

Ashton-under-Lyne.—Extensions to St. Anne's schools, Burlington Street, for Catholic Authorities (electrical installations); T. Warrington, builder, 51, Bennett Street, Hyde.

Banbury.—Additions to the main premises of the Co-operative Industrial Society, Ltd., Broad Street.

Bebington and Bromborough.—Houses (351); U.D.C. surveyor.

Birkenhead.—Flats (68), Canden Street; Mr. Rowse. Centralisation of institution kitchens; borough engineer. Extensions to St. Hugh's and Our Lady's Schools; Catholic trustees.

Birmingham.—Houses (74), Boldmere Road, Erdington; Morris Jacombs & Sons, Ltd., builders, 71, Hobmoor Road. Small Heath. Houses (22), Welford Road, Sutton; F. Biddle & Homer, builders, 20, Waterloo Street.

Bishop Auckland (DURHAM).—Houses (32), South Church Lane; J. Ford, surveyor, U.D.C. Offices.

Blackpool.—Private hotel and boarding house on the Promenade (electric lighting installation); Hawthorne & W. H. Bloor, builders, "Myrtles," Balmoral Avenue, Cleveleys.

Blyth (NORTHUMBERLAND).—Houses (200), South Farm Estate; L. Leeper, borough surveyor. Estate development, Wensleydale Terrace; Lord Ridley.

Bootle.—Alterations to Central Library; borough engineer.

Bournemouth.—Offices and works, Richmond Hill; Southern Newspapers, Ltd. Offices and stores, Wickham Road; Provident Direct Supply Stores. Shops and flats, Exeter Road; F. F. Tarrant. Ten shops, Holdenhurst Road; A. S. H. Whitelock.

Brean (SOMERSET).—Methodist Church; W. J. Pople & Sons, builders, Burnham-on-Sea.

Bridge of Allan (STIRLINGSHIRE).—Reconstruction of Royal Hotel, for R. Gillies; D. Beat, builder.

Bridlington.—Houses (50), South Back Lane Estate, and construction of bathing pool, entertainment hall, and open-air bandstand; surveyor, Town Hall.

Buxton (LANCS).—Conversion of the Crescent Hotel into cinema; R. T. Longden & W. J. Venables, architects, 20, Stafford Street, Hanley.

Cannock (STAFFS).—Bank, Stafford Road, for the National Provincial Bank, Ltd. (electric lighting and heating installations); C. Bryant & Sons, builders, Whitmore Road, Small Heath, Birmingham.

Canterbury.—Estate development, Nackington Road, for W. S. Cozens. Development of estate, Dover Road, for Truscott & Co., and St. Peter's Grove, for W. C. Oxbrow; H. C. Ashenden, architect.

Chelmsford.—Reconstruction of premises in King's Road; Christy Bros. & Co., Ltd.

Cheltenham.—Alterations and additions to Carr's Hotel, Clarence Street; Mrs. S. G. Cleveley.

Chesterfield.—Houses; borough engineer. Electricity showrooms, Holywell Street; Wilcockson & Cutts, architects, Saltergate. Alterations 2, 4 and 6, High Street; Marks & Spencer.

Chipping Norton.—Houses (22); R.D.C. surveyor.

Cradley Heath.—Development of estate, Dudley Wood, for houses; T. L. Tibbetts.

Darlington.—Premises for M. Jackson (Clothiers), Ltd.; P. L. Browne & Sons, architects, Pearl Buildings, Newcastle-on-Tyne.

Dumfries.—Extension of High School (£14,270); Master of Works, County Education Committee.

Duns (BERWICKSHIRE).—Houses (20); J. Coupland, burgh surveyor.

Ealing.—Houses (358), Sudbury Hill Estate; R. Costain and Sons, Ltd., 783, Norfolk Street, Strand, W.C.2. Factory, Bideford Avenue, for Alderman Silk Co., Ltd.; P. Bilton, Ltd., 113, Park Street, London, W.1. Flats (156), Greenford Hall Estate; Greenford Hall Estates, Ltd., Coston's Lane, Greenford. Houses (160) and shops, Perivale Estate, for The Wonder Homes, Ltd.; J. M. Wilson, architect, St. Quivox, Hayes. Houses (43), Russell Road and Clanson Avenue; W. Gradwell & Co., Ltd., Farnham Road, Slough, Bucks. Houses (24), shops, Priory Gardens, Rydal Crescent, and North Circular Road; R. Lancaster & Sons, Ltd., 30, Ealing Road, Wembley. Research laboratory, Wadsworth Road, for the Associated Lead Industries, Ltd., shops and flats, Western Avenue and Hanger Lane; T. P. Bennett & Sons, architects, 41, Bedford Row, W.C.1.

Eccles (LANCS).—Houses (20); borough surveyor.

Edinburgh.—Houses (34) at the Abercorn Crescent; J. Miller, builder.

Elgin.—Extensions to Infectious Diseases Hospital for the Moray and Nairn Public Health Committee; county clerk.

Enfield.—R.C. school; Sandy & Norris, 20, Bedford Row, London, W.C.

Essex.—School, Leigh Beck, for the County E.C.; J. Stuart, county architect, Chelmsford.

Exeter.—Church; Rev. F. C. Eddy, 13, Mont-le-Grand. Flats, King Street; Exeter Workmen's Dwellings Co., Ltd.

Farnham (SURREY).—Houses (50), Gordon Road; Captain Riches, builder.

Friern Barnet.—Houses (31), Bawtry Road; Bateman Building Co.

Gateshead-on-Tyne.—Branch premises at Lobley Hill, for Co-operative Wholesale Society; C.W.S. Architects' Dept., 90, Westmorland Road, Newcastle.

Gillingham (KENT).—Houses (136); J. L. Redfern, borough engineer.

Greenock.—Extension to spinning mill (£5,000) for Fleming, Reid & Co.; the manager.

Hampshire.—School (282 places), Purbrook, for the County E.C.; A. L. Roberts, county architect, Winchester.

Hebburn-on-Tyne.—Hotel at the corner of Black Road and Victoria Road East for W. G. Coulson; J. H. Morton and Son, Fowler Street, South Shields.

Hertfordshire.—Infirmary block, Nurses' Home, &c., Ware, with heating and electrical work (£33,965), for the P.A.C.; C. E. Elcock, architect, Windmillhill, London, N.W.3.

Isle of Man.—School, Pulrose, for the County E.C.; director of education, Douglas.

King's Lynn.—Canning factory, West Lynn, for Lincolnshire Canners, Ltd.; R. W. Dye, builder, South Gates.

Kingston (SURREY).—New premises for showrooms and stores, Cromwell Road; S. P. Anderson, architect, Creek House, High Street.

Leatherhead.—Municipal offices, Kingston housing site; U.D.C. surveyor.

London.—(FULHAM).—Extension of the Town Hall (£19,776); W. Cave, architect, 132a, Cromwell Road, S.W.7. (HITHER GREEN).—Shops, St. Mildred's Road and Hither Green Lane; A. Frampton. (LEWISHAM).—Development of Northbrook Park Estate; Wates (Streatham), Ltd. (STOKE NEWINGTON).—Flats (100), Amhurst Park; H. S. Fleming. Flats (56), Lordship Terrace (£32,000); borough engineer. (TOTTENHAM).—Factory extension, Fawley Road; Albion Sewing Cotton Co., Ltd. Swimming bath, Lordship Park; U.D.C. surveyor. School extensions, Risley Avenue and Devonshire Hill (£8,222), for the E.C.

Maidstone.—Extensions, Barming cannery, for Baird, Wolton & May, Ltd.

Manchester.—Houses (204), Clayton; housing director, Town Hall. Additions to factory premises, C. Whatmough, Ltd., 16, Vesta Street, Ancoats. Extension to Mossley Post Office; H.M. Office of Works, King Charles Street, London, S.W.1.

Marlow (BUCKS).—Houses (36), Oak Tree Road, for Jamieson Bros.

Motherwell.—Power house, &c., sewage purification works; burgh engineer.

Nelson.—Houses (20), Block Hall Estate; borough surveyor.

Newcastle-on-Tyne.—Extensions to business premises, A. Bedson, Regent Chambers, New Bridge Street; T. K. White, architect, Groat Market and Ridley Place.

Northampton.—Houses, Beatrice Road, Kettering; Phillips & Slow, builders, Hallwood Road, Kettering.

Oban.—Cinema for the Oban Cinema, Ltd.; the secretary. Pavilion and tea-rooms (£5,000) for the Corporation; burgh surveyor.

Oxfordshire.—Practical subjects' centre, Henley-on-Thames, for the County E.C.; T. O. Willson, director of education, New Road, Oxford.

Paisley.—Cinema, Glasgow Road; R. Clark, 101, Finchley Road, London, N.W.

Pontefract.—Showroom extensions, Back Northgate; Barber & Hasletine.

Portland.—Council offices (£7,193); Smith & Lander, Ltd.

Preston (LANCS).—Alterations to the branch at 81, Church Street of the Midland Bank Ltd.; Whinney, Son & Austen Hall, architects, 37, Norfolk Street, London, W.C.2.

St. Helens (LANCS).—Houses (36); borough surveyor. Dog racing tracks, St. Helens Greyhound Association and St. Helens Greyhound Racecourse Co.

Sanderstead.—Development of Sanderstead Hill; Morgan, Baines & Clark.

Shoreham (SUSSEX).—Houses (44); A. Saunders, builder, Upper Rock Gardens, Brighton.

South Shields.—Business premises, The Nook; T. A. Page & Sons, architects, 67, King Street.

Spalding.—Business stores, New Road (£10,000) for Greenall & Son.

Stafford.—Reconstruction, The Guildhall (£18,000); borough surveyor.

Staincliffe (YORKS).—Reinstatement after fire to mills; Crabtree & Co., Ltd., Spring Mills.

Stewarton (AYRSHIRE).—Houses (50); burgh surveyor.

Stockton-on-Tees.—Rebuilding of Hippodrome Theatre; Chadwick & Watson, architects, 9, Albion Street, Leeds.

Stoke-on-Trent.—Alterations to branch premises, Newcastle Street, for the Burslem and District Co-operative Society, Ltd., Wedgwood Place, Burslem.

Stourport.—Houses (80); M. Wilesmith & Son, builders, Malvern.

Sunderland.—Cabinet making factory for H. Binns, Son & Co., Ltd., Fawcett Street; Stafford & Sons, 5, Rudland Terrace.

Surrey.—Elementary school, Kenley, for the County E.C. Extensions to Ottershaw Isolation Hospital for the C.C.; clerk, Kingston-on-Thames.

Thornaby-on-Tees. — Residence, electrically equipped, Thornaby Green, for F. Smith.

Twickenham.—Alterations and additions to Nos. 20-22, King Street; F. W. Woolworth & Co., Ltd.

Upton (YORKS).—Police station; West Riding Architect, County Hall, Wakefield.

Wallsend.—Houses (218); borough engineer.

West Hartlepool.—Factory for the North of England Match Co.; Harland & Parker, builders.

Wheatley Hill (DURHAM).—Extensions and alterations to premises of Sherburn Co-operative Wholesale Society; C.W.S. Building Dept., West Blandford Street, Newcastle-on-Tyne.

Wigton (CUMBERLAND).—Conversion of premises into a factory for the British New Wrap Co.; Sir F. Mills, Chairman of the Company.